AAOS
American Academy of Orthopaedic Surgeons

Supplement to the Diagnosis and Prevention of Prosthetic Joint Infections Evidence-Based Clinical Practice Guideline

e-Appendix 2

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This supplementary material has been provided by the authors to give readers additional information about their work

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RISK FACTORS SECTION

Quality Evaluation Table 1- Non-Modifiable Risk Factors Prognostic Study Quality

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Adams,A.L., 2013	●	◑	○	●	◑	○	Include	Low Quality
Aggarwal,V.K., 2013	◑	◑	◑	●	○	◑	Include	Low Quality
Bedair,H., 2015	◑	◑	◑	●	◑	●	Include	Moderate Quality
Berbari,E.F., 1998	◑	●	◑	●	◑	○	Include	Low Quality
Best,M.J., 2015	◑	●	◑	●	○	●	Include	Low Quality
Bongartz,T., 2008	◑	◑	●	●	○	◑	Include	Low Quality
Bozic,K.J., 2012	◑	●	◑	●	◑	○	Include	Low Quality
Bozic,K.J., 2012	◑	●	◑	●	◑	○	Include	Low Quality
Bozic,K.J., 2014	◑	◑	◑	●	◑	○	Include	Low Quality
Cai,J., 2014	◑	◑	◑	●	◑	○	Include	Low Quality
Cavanaugh,P.K., 2015	●	◑	◑	○	◑	◑	Include	Low Quality
Crowe,B., 2015	●	●	◑	●	○	○	Include	Low Quality
Dale,H., 2009	◑	◑	◑	●	○	◑	Include	Low Quality
Dale,H., 2011	●	◑	●	○	◑	◑	Include	Low Quality
Dale,H., 2012	●	◑	◑	●	○	●	Include	Low Quality
Debreuve-Theresette,A., 2015	◑	●	◑	●	◑	○	Include	Low Quality
Deegan,B.F., 2014	◑	◑	◑	●	○	◑	Include	Low Quality
Deleuran,T., 2015	●	◑	◑	●	◑	◑	Include	Moderate Quality
Dowsey,M.M., 2008	◑	●	◑	●	○	○	Include	Low Quality
Dowsey,M.M., 2009	◑	●	◑	●	◑	○	Include	Low Quality
Gallardo-Calero,I., 2016	◑	◑	◑	●	○	●	Include	Low Quality
Gandhi,R., 2009	●	●	◑	●	○	○	Include	Low Quality
Garcia-Alvarez,F., 2010	◑	●	◑	●	◑	○	Include	Low Quality
George,M.D., 2017	◑	●	◑	●	◑	●	Include	Moderate Quality
Gou,W., 2014	◑	◑	●	●	◑	○	Include	Low Quality

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Grammatico-Guillon,L., 2015	●	●	◑	●	◑	○	Include	Low Quality
Hailer,N.P., 2010	●	◑	◑	●	○	◑	Include	Low Quality
Hinarejos,P., 2013	◑	●	◑	●	○	○	Include	Low Quality
Honkanen,M., 2017	●	●	○	●	◑	○	Include	Low Quality
Issa,K., 2017	◑	◑	●	●	○	○	Include	Low Quality
Jamsen,E., 2010	●	●	●	○	◑	○	Include	Low Quality
Jiang,S.L., 2014	◑	●	◑	●	◑	◑	Include	Low Quality
Kao,F.C., 2017	◑	●	◑	●	◑	○	Include	Low Quality
Kildow,B.J., 2017	◑	●	●	●	○	◑	Include	Low Quality
Kildow,B.J., 2017	◑	●	◑	●	◑	◑	Include	Low Quality
Klement,M.R., 2016	◑	◑	◑	●	○	◑	Include	Low Quality
Koenig,K., 2012	◑	●	◑	○	○	●	Include	Low Quality
Kreder,H.J., 2003	◑	●	◑	●	○	◑	Include	Low Quality
Kuo,L.-T., 2017	◑	◑	●	●	◑	○	Include	Low Quality
Kuo,S.J., 2016	●	●	◑	●	◑	○	Include	Low Quality
Lee,Q.J., 2015	◑	●	◑	●	○	○	Include	Low Quality
Lin,C.A., 2013	◑	●	◑	●	○	◑	Include	Low Quality
Long,G., 2016	◑	◑	◑	●	◑	○	Include	Low Quality
Lu,M., 2017	●	●	◑	●	◑	○	Include	Low Quality
Miric,A., 2014	◑	●	●	●	◑	◑	Include	Moderate Quality
Miric,A., 2014	●	●	●	●	◑	◑	Include	Moderate Quality
Mortazavi,S.M., 2010	◑	●	◑	●	○	○	Include	Low Quality
Muilwijk,J., 2006	●	●	◑	●	◑	○	Include	Low Quality
Namba,R.S., 2012	●	●	◑	●	◑	○	Include	Low Quality
Namba,R.S., 2013	◑	●	◑	●	◑	○	Include	Low Quality
Ohmann,C., 2010	●	●	●	○	◑	●	Include	Moderate Quality
Ong,K.L., 2009	●	●	◑	●	●	○	Include	Moderate Quality
Pedersen,A.B., 2010	●	◑	◑	●	◑	○	Include	Low Quality

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Pour,A.E., 2011	◑	◑	◑	●	◑	◑	Include	Low Quality
Pulido,L., 2008	◑	◑	◑	●	◑	○	Include	Low Quality
Rotevatn,T.A., 2017	◑	●	○	●	◑	◑	Include	Low Quality
Schrama,J.C., 2010	●	◑	◑	●	○	●	Include	Low Quality
Schrama,J.C., 2015	●	◑	●	●	○	◑	Include	Low Quality
Silva,M., 2005	◑	●	◑	●	○	◑	Include	Low Quality
Song,K.H., 2012	●	●	◑	●	○	○	Include	Low Quality
Soriano,A., 2008	◑	●	●	●	○	○	Include	Low Quality
Tabatabaee,R.M., 2015	●	◑	◑	●	◑	◑	Include	Low Quality
Tan,T.L., 2016	◑	●	◑	●	○	◑	Include	Low Quality
Tayton,E.R., 2016	●	◑	◑	●	◑	○	Include	Low Quality
Triantafyllopoulos,G.K., 2016	◑	●	◑	●	◑	○	Include	Low Quality
Wang,H., 2015	◑	◑	◑	●	◑	○	Include	Low Quality
Wilson,M.G., 1990	◑	●	◑	●	◑	○	Include	Low Quality
Wu,C., 2014	◑	◑	◑	●	◑	○	Include	Low Quality

Quality Evaluation Table 2- Modifiable Risk Factor Prognostic Studies

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Adams,A.L., 2013	●	◑	○	●	◑	○	Include	Low Quality
Alvi,H.M., 2015	●	●	●	●	◑	◑	Include	Moderate Quality
Amlie,E., 2016	◑	●	◑	●	◑	○	Include	Low Quality
Berbari,E.F., 1998	◑	●	◑	●	◑	○	Include	Low Quality
Best,M.J., 2015	●	●	◑	●	○	○	Include	Low Quality
Bozic,K.J., 2012	◑	●	◑	●	◑	○	Include	Low Quality
Bozic,K.J., 2012	◑	●	◑	●	◑	○	Include	Low Quality
Bozic,K.J., 2014	◑	◑	◑	●	◑	○	Include	Low Quality

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Cai,J., 2014	◑	◑	◑	●	◑	○	Include	Low Quality
Chan,P.K.H., 2005	◑	◑	◑	●	◑	○	Include	Low Quality
Chee,Y.H., 2010	◑	◑	●	●	○	◑	Include	Low Quality
Chen,A.F., 2017	◑	●	◑	●	◑	◑	Include	Low Quality
Chrastil,J., 2015	◑	●	◑	●	○	●	Include	Low Quality
Davis,A.M., 2011	◑	◑	●	●	◑	○	Include	Low Quality
Dowsey,M.M., 2008	◑	●	◑	●	○	○	Include	Low Quality
Dowsey,M.M., 2009	◑	●	◑	●	◑	○	Include	Low Quality
Duchman,K.R., 2015	●	●	○	●	○	◑	Include	Low Quality
Erkocak,O.F., 2016	◑	●	◑	●	○	◑	Include	Low Quality
Frisch,N., 2016	◑	◑	◑	●	○	●	Include	Low Quality
Gandhi,R., 2009	●	●	◑	●	○	○	Include	Low Quality
Garcia-Alvarez,F., 2010	◑	●	◑	●	◑	○	Include	Low Quality
Gou,W., 2014	◑	◑	●	●	◑	○	Include	Low Quality
Greenky,M., 2012	◑	●	●	●	◑	○	Include	Moderate Quality
Grosso,M.J., 2017	◑	●	◑	●	●	○	Include	Low Quality
Hailer,N.P., 2010	●	◑	◑	●	○	◑	Include	Low Quality
Hanna,S.A., 2017	◑	◑	◑	●	○	●	Include	Low Quality
Hinarejos,P., 2013	◑	●	◑	●	○	○	Include	Low Quality
Honkanen,M., 2017	●	●	○	●	◑	○	Include	Low Quality
Inacio,M.C., 2014	◑	●	●	●	○	◑	Include	Low Quality
Jamsen,E., 2010	◑	●	◑	●	○	○	Include	Low Quality
Jamsen,E., 2012	◑	●	◑	●	◑	○	Include	Low Quality
Kamath,A.F., 2016	◑	●	○	●	◑	◑	Include	Low Quality
Kao,F.C., 2017	◑	●	◑	●	◑	○	Include	Low Quality
Kildow,B.J., 2017	◑	●	●	●	○	◑	Include	Low Quality
Lee,Q.J., 2015	◑	●	◑	●	○	○	Include	Low Quality
Lehman,D.E., 1994	◑	●	◑	●	○	◑	Include	Low Quality

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Lombardi,A.V.,Jr., 2013	◑	◑	◑	●	○	◑	Include	Low Quality
Long,G., 2016	◑	◑	◑	●	◑	○	Include	Low Quality
Lubbeke,A., 2007	●	●	●	●	○	○	Include	Low Quality
Lubbeke,A., 2008	●	◑	●	●	○	○	Include	Low Quality
Lubbeke,A., 2016	◑	●	◑	●	◑	●	Include	Moderate Quality
Manrique,J., 2017	◑	●	◑	●	○	●	Include	Low Quality
Maradit,Kremers H., 2015	◑	●	○	●	◑	●	Include	Low Quality
Martin,J.R., 2015	◑	◑	◑	●	○	◑	Include	Low Quality
Mazoch,M., 2016	◑	●	◑	●	○	◑	Include	Low Quality
McCalden,R.W., 2011	●	◑	◑	●	○	◑	Include	Low Quality
Meehan,J.P., 2014	◑	◑	◑	●	○	●	Include	Low Quality
Meller,M.M., 2016	◑	●	◑	●	◑	◑	Include	Low Quality
Meller,M.M., 2016	◑	●	○	●	◑	●	Include	Low Quality
Namba,R.S., 2005	●	◑	●	●	○	◑	Include	Low Quality
Namba,R.S., 2012	●	●	◑	●	◑	○	Include	Low Quality
Namba,R.S., 2013	◑	●	◑	●	◑	○	Include	Low Quality
Nickel,B.T., 2016	◑	●	◑	●	○	◑	Include	Low Quality
Pedersen,A.B., 2010	●	◑	◑	●	◑	○	Include	Low Quality
Pedersen,A.B., 2010	●	◑	●	●	◑	◑	Include	Moderate Quality
Purcell,R.L., 2016	◑	◑	◑	●	○	◑	Include	Low Quality
Rotevatn,T.A., 2017	◑	●	○	●	◑	◑	Include	Low Quality
Sahota,S., 2018	◑	●	◑	●	◑	◑	Include	Low Quality
Shohat,N., 2017	●	●	◑	●	◑	○	Include	Low Quality
Singh,H., 2015	◑	●	●	●	○	○	Include	Low Quality
Singh,J.A., 2015	●	◑	◑	○	○	●	Include	Low Quality
Song,K.H., 2012	●	●	◑	●	○	○	Include	Low Quality
Soriano,A., 2008	◑	●	●	●	○	○	Include	Low Quality
Sousa,R., 2014	●	◑	●	●	○	○	Include	Low Quality

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Tan,T.L., 2016	◑	●	◑	●	○	◑	Include	Low Quality
Tarabichi,M., 2017	●	●	○	●	◑	○	Include	Low Quality
Tayton,E.R., 2016	●	◑	◑	●	◑	○	Include	Low Quality
Wagner,E.R., 2016	◑	◑	●	●	○	●	Include	Moderate Quality
Wang,H., 2015	◑	◑	◑	●	◑	○	Include	Low Quality
Watts,C., 2016	◑	◑	●	●	○	◑	Include	Low Quality
Watts,C.D., 2016	◑	●	○	●	◑	◑	Include	Low Quality
Wu,C., 2014	◑	◑	◑	●	◑	○	Include	Low Quality
Zorrilla,P., 2006	◑	●	●	●	○	○	Include	Low Quality

Figure 1: Summary of Findings-Obesity

↑ **Better Outcomes**
↓ **Worse Outcomes**
● **Not Significant**

	Moderate Quality			Low Quality																															
	Lubbeke,A., 2016	Alvi,H.M., 2015	Wagner,E.R., 2016	Bozic,K.J., 2012	Bozic,K.J., 2014	Hinarejos,P., 2013	Namba,R.S., 2012	Dowsey,M.M., 2008	Meller,M.M., 2016	Purcell,R.L., 2016	Amlie,E., 2016	Inacio,M.C., 2014	Davis,A.M., 2011	Gandhi,R., 2009	Lubbeke,A., 2008	Lubbeke,A., 2007	Lehman,D.E., 1994	McCalden,R.W., 2011	Chee,Y.H., 2010	Namba,R.S., 2005	Hanna,S.A., 2017	Grammatico-Guillon,L., 2015	Jiang,S.L., 2014	Wu,C., 2014	Sousa,R.J., 2016	Chrastil,J., 2015	Sousa,R., 2014	Cai,J., 2014	Chen,A.F., 2017	Bozic,K.J., 2012	Lee,Q.J., 2015	Namba,R.S., 2013	Mortazavi,S.M., 2010	Meller,M.M., 2016	Frisch,N., 2016
Hip/Knee Combined Complications																																			
Infection(PJI)	↓																					↓	↓	↓	●	●	●	↓	↓						
Infection(deep incisional)		↓																																	
Knee Complications																																			
Infection(PJI)																														↓	●			↓	
Infection(deep)			↓			●																										↓	●		
Wound healing complication(wound dehiscence)																																		↓	
Infection(involves deep soft tissue)												●																							
Infection(Deep surgical site infection)																																			↓
Hip Complications																																			
Infection(PJI)				↓	↓			↓	↓	↓					●																				
Infection(deep)							↓							●		↓																			
Wound healing complication(Delayed wound healing)																	●																		
Wound healing complication(wound dehiscence)									↓	●																									
Infection(Revision due to PJI)											●																								
Infection(involves deep soft tissue)												●																							
Infection(deep, based on clinical and radiological grounds and confirmed by intraoperative culture during revi)													●																						
Hip Reoperation																																			
Infection(septic revision)																		↓																	
Infection(reoperation for deep infection)																			●																
Infection(revision for septic loosening)																●																			
Infection(reoperation for infection)																				●															
Revision(re-revision for deep infection)																					↓														

Figure 2: Summary of Findings-Cardiac disease

	Low Quality													
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	Bozic,K.J., 2012	Bozic,K.J., 2014	Dowsey,M.M., 2008	Grammatico-Guillon,L., 2015	Wu,C., 2014	Kao,F.C., 2017	Honkanen,M., 2017	Bozic,K.J., 2012	Lee,Q.J., 2015	Long,G., 2016	Mortazavi,S.M., 2010	Dowsey,M.M., 2009	Tabatabaee,R.M., 2015	Aggarwal,V.K., 2013
Hip/Knee Combined Complications														
Infection(PJI)				●	●	●	●							
Wound healing complication(hematoma and/or seroma)													↑	
Infection(hospital readmission fo PJI)														↓
Knee Complications														
Infection(PJI)								↓	↓	↓		●		
Infection(deep)											●			
Hip Complications														
Infection(PJI)	↓	●	●											

Figure 3: Summary of Findings-Immunocompromised Other

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Low Quality**									
	Bozic,K.J., 2012	**Grammatico-Guillon,L., 2015**	**Wu,C., 2014**	**Kao,F.C., 2017**	**Honkanen,M., 2017**	**Cai,J., 2014**	**Bozic,K.J., 2012**	**Mortazavi,S.M., 2010**	**Hailer,N.P., 2010**	**Berbari,E.F., 1998**
Hip/Knee Combined Complications										
Infection(PJI)		●	●	↓	●	↓				↓
Knee Complications										
Infection(PJI)							↓			
Infection(deep)								●		
Hip Complications										
Infection(PJI)	●									
Hip Reoperation										
Infection(revision for infection)									●	

Figure 4: Summary of Findings-Immunocompromised transplant

↑ **Better Outcomes**
↓ **Worse Outcomes**
● **Not Significant**

	Low Quality	
	Klement,M.R., 2016	**Cavanaugh,P.K., 2015**
Hip/Knee Combined Complications		
Wound healing complication(wound complications in hospital)		↓
Hip Complications		
Infection(PJI)	↓	
Infection(PJI overall time point)	↓	

Figure 5: Summary of Findings-Peripheral vascular disease

	Low Quality					
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Bozic,K.J., 2012**	**Bozic,K.J., 2014**	**Jiang,S.L., 2014**	**Kao,F.C., 2017**	**Bozic,K.J., 2012**	**Mortazavi,S.M., 2010**
Hip/Knee Combined Complications						
Infection(PJI)			↓	●		
Knee Complications						
Infection(PJI)					↓	
Infection(deep)						●
Hip Complications						
Infection(PJI)	↓	●				

Figure 6: Summary of Findings- Inflammatory Arthritis

	Moderate Quality	Low Quality																				
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**George,M.D., 2017**	**Bozic,K.J., 2012**	**Bozic,K.J., 2014**	**Soriano,A., 2008**	**Gandhi,R., 2009**	**Wu,C., 2014**	**Sousa,R.J., 2016**	**Honkanen,M., 2017**	**Bozic,K.J., 2012**	**Mortazavi,S.M., 2010**	**Schrama,J.C., 2015**	**Dale,H., 2012**	**Dale,H., 2009**	**Salvati,E.A., 1982**	**Triantafyllopoulos,G.K., 2016**	**Schrama,J.C., 2010**	**Pedersen,A.B., 2010**	**Hailer,N.P., 2010**	**Bongartz,T., 2008**	**Jamsen,E., 2010**	**Kreder,H.J., 2003**	**Wilson,M.G., 1990**
Hip/Knee Combined Complications																						
Infection(PJI)	●					●	●	●											↓			
Infection(postoperative wound infection)														↓								
Knee Complications																						
Infection(PJI)									↓											●		
Infection(deep)										↓												↓
Infection(deep tissue)				●																		
Infection(revision for infection at 6 or more years after surgery)																↓						
Infection(revision for infection at 1 year)																↓						
Infection(revision for infection between 1 and 6 years)																●						
Infection(readmission for knee infection)																					↓	
Hip Complications																						
Infection(PJI)		↓	●												↓							
Infection(deep)					●																	
Infection(revision due to infection)											↓											
Infection(revision for infection at 6 or more years after surgery)																↓						
Infection(revision for infection at 1 year)																●						
Infection(revision for infection between 1 and 6 years)																●						
Hip Reoperation																						
Infection(revision for infection)												↓					●	↓				
Revision(revision for infection)													●									

Figure 7: Summary of Findings-Prior joint infection

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Moderate Quality Bedair,H., 2015	Low Quality Mortazavi,S.M., 2010
Hip/Knee Combined Complications		
Infection(PJI)	↓	
Knee Complications		
Infection(deep)		↓

Figure 8: Summary of Findings-Renal disease

↑ **Better Outcomes**
↓ **Worse Outcomes**
● **Not Significant**

	Moderate Quality		Low Quality												
	Miric,A., 2014	**Miric,A., 2014**	**Bozic,K.J., 2012**	**Bozic,K.J., 2014**	**Kildow,B.J., 2017**	**Grammatico-Guillon,L., 2015**	**Wu,C., 2014**	**Kao,F.C., 2017**	**Bozic,K.J., 2012**	**Lee,Q.J., 2015**	**Kuo,S.J., 2016**	**Mortazavi,S.M., 2010**	**Erkocak,O.F., 2016**	**Tan,T.L., 2016**	**Kuo,L.-T., 2017**
Hip/Knee Combined Complications															
Infection(PJI)						↓	●	●					●		
Knee Complications															
Infection(PJI)									↓	●	●				●
Infection(deep)		●										●			
Hip Complications															
Infection(PJI)			●	●	↓										
Infection(deep)	●														
Hip/Knee Combined Reoperation															
Infection(revision for PJI)														↓	
Knee Reoperation															
Infection(requiring debridement)															●
Infection(requiring implant removal)															●

Figure 9: Summary of Findings-ESRD (kidney failure)

	Moderate Quality	Low Quality
↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Miric,A., 2014	Deegan,B.F., 2014
Hip/Knee Combined Complications		
Infection(joint infection)		●
Wound healing complication(hematoma)		●
Knee Complications		
Infection(joint infection)		●
Hip Complications		
Infection(joint infection)		●
Infection(deep infections. all were revised. quality = Low due to no confounding adjustment)	●	

Figure 10: Summary of Findings-Liver disease all

	Low Quality								
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Bozic,K.J., 2012**	**Bozic,K.J., 2014**	**Grammatico-Guillon,L., 2015**	**Wu,C., 2014**	**Kao,F.C., 2017**	**Cai,J., 2014**	**Bozic,K.J., 2012**	**Lee,Q.J., 2015**	**Mortazavi,S.M., 2010**
Hip/Knee Combined Complications									
Infection(PJI)			↓	●	↓	↓			
Knee Complications									
Infection(PJI)							●	●	
Infection(deep)									●
Hip Complications									
Infection(PJI)	●	●							

Figure 11: Summary of Findings-Liver disease cirrhosis

	Moderate Quality	Low Quality	
↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Deleuran,T., 2015	Jiang,S.L., 2014	Kuo,S.J., 2016
Hip/Knee Combined Complications			
Infection(PJI)		↓	
Infection(deep prosthetic joint infection)	↓		
Knee Complications			
Infection(PJI)			●

Figure 12: Summary of Findings-Liver disease Hepatitis

	Low Quality				
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Jiang,S.L., 2014**	**Kuo,S.J., 2016**	**Kildow,B.J., 2017**	**Pour,A.E., 2011**	**Best,M.J., 2015**
Hip/Knee Combined Complications					
Infection(PJI)	↓				
Wound healing complication(persistent wound drainage)				●	
Infection(in hospital Infection of device (icd9 996.66))					↓
Knee Complications					
Infection(PJI)		↓	↓		
Wound healing complication(persistent wound drainage)				●	
Infection(deep infection requiring revision)				●	
Hip Complications					
Infection(PJI)			↓		
Wound healing complication(persistent wound drainage)				↓	

Figure 13: Summary of Findings-mental health

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Low Quality Bozic,K.J., 2012	Bozic,K.J., 2014	Bozic,K.J., 2012
Knee Complications			
Infection(PJI)			↓
Hip Complications			
Infection(PJI)	↓	↓	

Figure 14: Summary of Findings-Alcohol Abuse

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Low Quality Bozic,K.J., 2012	Grammatico-Guillon,L., 2015	Jiang,S.L., 2014	Wu,C., 2014	Rotevatn,T.A., 2017	Bozic,K.J., 2012
Hip/Knee Combined Complications						
Infection(PJI)		↓	↓	↓	↓	
Knee Complications						
Infection(PJI)						●
Hip Complications						
Infection(PJI)	●					

Figure 15: Summary of Findings-Anemia

	Moderate Quality	Low Quality						
↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Greenky,M., 2012	Bozic,K.J., 2012	Bozic,K.J., 2014	Wu,C., 2014	Pulido,L., 2008	Lu,M., 2017	Bozic,K.J., 2012	Lee,Q.J., 2015
Hip/Knee Combined Complications								
Infection(PJI)	↓			●	●			
Infection(deep infection)						↓		
Knee Complications								
Infection(PJI)							↓	↓
Hip Complications								
Infection(PJI)		↓	●					

Figure 16: Summary of Findings-Smoking/tobacco use

	Low Quality											
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	Dowsey,M.M., 2008	Sahota,S., 2018	Lombardi,A.V.,Jr., 2013	Jiang,S.L., 2014	Wu,C., 2014	Chrastil,J., 2015	Debreuve-Theresette,A., 2015	Singh,J.A., 2015	Duchman,K.R., 2015	Long,G., 2016	Crowe,B., 2015	Dowsey,M.M., 2009
Hip/Knee Combined Complications												
Infection(PJI)				●	●	●						
Infection(deep)							↓	↓				
Wound healing complication(wound dehiscence)									↓			
Infection(deep soft tissues or any part of the anatomy (eg, organs or spaces))		↓										
Infection(deep wound)									↓			
Knee Complications												
Infection(PJI)										↓	↓	●
Infection(deep soft tissues or any part of the anatomy (eg, organs or spaces))		●										
Hip Complications												
Infection(PJI)	●											
Infection(deep soft tissues or any part of the anatomy (eg, organs or spaces))		↓										
Hip Reoperation												
Infection(failure(revision or removal of the acetabular shell) due to infection)			↓									
Hip/Knee Combined Reoperation												
Infection(revision for infection)								●				

Figure 17: Summary of Findings-Malnutrition

	Moderate Quality	Low Quality			
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Wagner,E.R., 2016**	**Zorrilla,P., 2006**	**Grammatico-Guillon,L., 2015**	**Kamath,A.F., 2016**	**Manrique,J., 2017**
Hip/Knee Combined Complications					
Infection(PJI)			↓		
Knee Complications					
Infection(deep infection)					↓
Infection(deep)	●				
Infection(deep incisional)				↓	
Infection(deep organ space)				↓	
Wound healing complication(Wound disruption)				●	
Hip Complications					
Wound healing complication(Delayed wound healing)		↓			

Figure 18: Summary of Findings-Diabetes

↑ **Better Outcomes**
↓ **Worse Outcomes**
● **Not Significant**

	Moderate Quality	Low Quality																															
	Pedersen,A.B., 2010	**Song,K.H., 2012**	**Bozic,K.J., 2012**	**Bozic,K.J., 2014**	**Hinarejos,P., 2013**	**Soriano,A., 2008**	**Kildow,B.J., 2017**	**Namba,R.S., 2012**	**Garcia-Alvarez,F., 2010**	**Dowsey,M.M., 2008**	**Chan,P.K.H., 2005**	**Grammatico-Guillon,L., 2015**	**Jiang,S.L., 2014**	**Wu,C., 2014**	**Kao,F.C., 2017**	**Sousa,R.J., 2016**	**Maradit,Kremers H., 2015**	**Gou,W., 2014**	**Jamsen,E., 2012**	**Mazoch,M., 2016**	**Honkanen,M., 2017**	**Bozic,K.J., 2012**	**Lee,Q.J., 2015**	**Long,G., 2016**	**Kuo,S.J., 2016**	**Watts,C.D., 2016**	**Crowe,B., 2015**	**Namba,R.S., 2013**	**Adams,A.L., 2013**	**Mortazavi,S.M., 2010**	**Jamsen,E., 2010**	**Namba,R.S., 2009**	**Dowsey,M.M., 2009**
Hip/Knee Combined Complications																																	
Infection(PJI)												●	↓	↓	●	●	●	↓	↓		●												
Wound healing complication(Delayed wound healing)																				●													
Knee Complications																																	
Infection(PJI)																						↓	↓	↓	↓	●	●		●		●		↓
Infection(deep)					●																							↓		●		●	
Infection(deep incisional and/or organ space infection)		●																															
Infection(deep tissue)						●																											
Hip Complications																																	
Infection(PJI)			↓	●			↓			●																							
Infection(deep)								●	●		●																						
Infection(deep incisional and/or organ space infection)		↓																															
Hip Reoperation																																	
Infection(revision for deep infection)	↓																																

Figure 19: Summary of Findings-Uncontrolled diabetes

↑ **Better Outcomes**
↓ **Worse Outcomes**
● **Not Significant**

	Moderate Quality	Low Quality								
	Pedersen,A.B., 2010	**Maradit,Kremers H., 2015**	**Jamsen,E., 2012**	**Chrastil,J., 2015**	**Shohat,N., 2017**	**Tarabichi,M., 2017**	**Watts,C.D., 2016**	**Adams,A.L., 2013**	**Jamsen,E., 2010**	**Chiu,F.Y., 2001**
Hip/Knee Combined Complications										
Infection(PJI)		●	●	↓	↓	↓				
Infection(Wound Complications)						●				
Knee Complications										
Infection(PJI)							↓	●	↓	
Infection(deep)										●
Hip Reoperation										
Infection(revision for deep infection)	↓									

Figure 20: Summary of Findings- Obesity:bariatric surgery

	Low Quality		
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Watts,C., 2016**	**Nickel,B.T., 2016**	**Martin,J.R., 2015**
Knee Complications			
Infection(PJI)		↓	●
Hip Complications			
Infection(PJI)	●		

Figure 21: Summary of Findings-Drug use

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Low Quality**				
	Bozic,K.J., 2012	**Bozic,K.J., 2014**	**Grammatico-Guillon,L., 2015**	**Best,M.J., 2015**	**Bozic,K.J., 2012**
Hip/Knee Combined Complications					
Infection(PJI)			●	↓	
Knee Complications					
Infection(PJI)					●
Hip Complications					
Infection(PJI)	●	●			

Figure 22: Summary of Findings-Recent infection: Urinary Tract Infection or Asymptomatic Bacteriuria

	Low Quality					
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Bozic,K.J., 2012**	**Gou,W., 2014**	**Honkanen,M., 2017**	**Sousa,R., 2014**	**Bozic,K.J., 2012**	**Singh,H., 2015**
Hip/Knee Combined Complications						
Infection(PJI)		●	●	↓		
Knee Complications						
Infection(PJI)					●	
Wound healing complication(Delayed wound healing)						●
Hip Complications						
Infection(PJI)	●					

Figure 23: Summary of Findings-Active infection at other sites

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Low Quality Song,K.H., 2012
Hip/Knee Combined Complications	
Infection(deep incisional and/or organ space infection)	↓
Knee Complications	
Infection(deep incisional and/or organ space infection)	●
Hip Complications	
Infection(deep incisional and/or organ space infection)	●

Figure 24: Summary of Findings-Active thromboprophylaxis/anticoagulation state

	Low Quality		
↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Bozic,K.J., 2012	Bozic,K.J., 2014	Bozic,K.J., 2012
Knee Complications			
Infection(PJI)			●
Hip Complications			
Infection(PJI)	↓	●	

Figure 25: Summary of Findings-Immunocompromised HIV

	Low Quality				
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Jiang,S.L., 2014**	**Lin,C.A., 2013**	**Kildow,B.J., 2017**	**Issa,K., 2017**	**Silva,M., 2005**
Hip/Knee Combined Complications					
Infection(PJI)	●				
Knee Complications					
Infection(PJI)		●	↓	●	
Infection(deep infection)					●
Wound healing complication(wound complication)		●			
Hip Complications					
Infection(PJI)		●	↓		
Wound healing complication(wound complication)		●			
Hip Reoperation					
Infection(need for irrigation and debridement)		↓			
Knee Reoperation					
Infection(need for irrigation and debridement)		●			

Figure 26: Summary of Findings-Age

↑ Better Outcomes
↓ Worse Outcomes
● Not Significant

	Moderate Quality			Low Quality																													
	Ong,K.L., 2009	George,M.D., 2017	Ohmann,C., 2010	Namba,R.S., 2012	Garcia-Alvarez,F., 2010	Dowsey,M.M., 2008	Amlie,E., 2016	Gandhi,R., 2009	Hinarejos,P., 2013	Wu,C., 2014	Sousa,R.J., 2016	Gou,W., 2014	Honkanen,M., 2017	Chrastil,J., 2015	Cai,J., 2014	Chen,A.F., 2017	Tarabichi,M., 2017	Lee,Q.J., 2015	Watts,C.D., 2016	Namba,R.S., 2013	Mortazavi,S.M., 2010	Namba,R.S., 2009	Chiu,F.Y., 2001	Schrama,J.C., 2015	Dale,H., 2012	Dale,H., 2009	Wang,H., 2015	Koenig,K., 2012	Dale,H., 2011	Muilwijk,J., 2006	Pedersen,A.B., 2010	Hailer,N.P., 2010	Meehan,J.P., 2014
Hip/Knee Combined Complications																																	
Infection(PJI)		●								↓	●	●	↓		↓	↑																	
Infection(in diabetic patient population)														↑																			
Infection(Wound Complications)																	●																
Knee Complications																																	
Infection(PJI)																		↑	●														
Infection(deep)									●											●	●	↑	●				●						
Wound healing complication(Postoperative Hematoma or Secondary Bleeding)			↓																														
Hip Complications																																	
Infection(PJI)	●					●																											
Infection(deep)				●	●			●																				●		●			
Infection(Revision due to PJI)							●																										
Infection(revision due to infection)																								●									
Infection(Data from NOIS register)																													↓				
Infection(Data from NAR register)																													↓				
Hip Reoperation																																	
Infection(revision for infection)																									●						●	●	
Revision(revision for infection)																										●							
Knee Reoperation																																	
Infection(Revision due to PJI)																																	↑

Figure 27: Summary of Findings-Dementia

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Low Quality Bozic,K.J., 2012	Garcia-Alvarez,F., 2010	Pulido,L., 2008	Bozic,K.J., 2012
Hip/Knee Combined Complications				
Infection(PJI)			●	
Knee Complications				
Infection(PJI)				●
Hip Complications				
Infection(PJI)	●			
Infection(deep)		●		

Figure 28: Summary of Findings-Poor dental health

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Wu,C., 2014 Low Quality
Hip/Knee Combined Complications	
Infection(PJI)	●

Figure 29: Summary of Findings-Institutionalization

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Gallardo-Calero,I., 2016** / **Low Quality**
Hip Complications	
Infection(PJI)	↓

Figure 30: Summary of Findings-Autoimmune disease

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Jiang,S.L., 2014 Low Quality
Hip/Knee Combined Complications	
Infection(PJI)	↓

Table 1: Obesity

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wagner,E.R., 2016	Moderate Quality	Infection (deep)	Post-Op	22289	Modifiable risk factor optimization (Primary TKA)	BMI 30 to 34.9 vs. 18 to 24.99	age, sex, surgical indication, and time period of the surgical procedure	Hazard ratio(CI)	0.93 (0.64 to 1.36)	NS
Wagner,E.R., 2016	Moderate Quality	Infection (deep)	Post-Op	22289	Modifiable risk factor optimization (Primary TKA)	BMI 35 to 39.9 vs. 18 to 24.99	age, sex, surgical indication, and time period of the surgical procedure	Hazard ratio(CI)	1.35 (0.88 to 2.07)	NS
Wagner,E.R., 2016	Moderate Quality	Infection (deep)	Post-Op	22289	Modifiable risk factor optimization (Primary TKA)	BMI 25 to 29.9 vs. 18 to 24.99	age, sex, surgical indication, and time period of the surgical procedure	Hazard ratio(CI)	1.03 (0.71 to 1.48)	NS
Wagner,E.R., 2016	Moderate Quality	Infection (deep)	Post-Op	22289	Modifiable risk factor optimization (Primary TKA)	BMI 40 or greater vs. 18 to 24.99	age, sex, surgical indication, and time period of the surgical procedure	Hazard ratio(CI)	2.25 (1.45 to 3.49)	morbid obesity increased risk of deep infection
Meller,M.M., 2016	Low Quality	Wound healing complication (wound dehiscence)	3 months	10712	Modifiable risk factor optimization (primary THA using medicare claims data)	BMI 50 or higher vs. BMI 40-49	age, sex, race, resident census region, economic status. hospital type, bed size, hospital teachin/non teaching status, hospital volume	hazard ratio(CI)	2.85(1.77–4.59)	superobese patients were at higher risk of wound dehiscence
Meller,M.M., 2016	Low Quality	Wound healing complication (wound dehiscence)	3 months	377487	Modifiable risk factor optimization (primary THA using medicare claims data)	BMI 50 or higher vs. BMI less than 25	age, sex, race, resident census region, economic status. hospital type, bed size, hospital teachin/non teaching status, hospital volume	hazard ratio(CI)	9.81(6.31–15.24)	superobese patients were at higher risk of wound dehiscence

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Meller,M.M., 2016	Low Quality	Infection (PJI)	3 months	377487	Modifiable risk factor optimization (primary THA using medicare claims data)	BMI 50 or higher vs. BMI less than 25	age, sex, race, resident census region, economic status. hospital type, bed size, hospital teachin/non teaching status, hospital volume	Hazard ratio(CI)	6.48(4.54–9.25)	superobese patients were at higher risk of PJI
Meller,M.M., 2016	Low Quality	Infection (PJI)	3 months	10712	Modifiable risk factor optimization (primary THA using medicare claims data)	BMI 50 or higher vs. BMI 40-49	age, sex, race, resident census region, economic status. hospital type, bed size, hospital teachin/non teaching status, hospital volume	Hazard ratio(CI)	1.87(1.28–2.74)	superobese patients were at higher risk of PJI
Meller,M.M., 2016	Low Quality	Wound healing complication (Wound dehiscence)	3 months	585127	Modifiable risk factor optimization (primary TKAs from Medicare claims data)	BMI of 50 or higher vs. 40-49	age, gender, race, resident census region, economic status using state Medicaid buyin as a proxy, and overall health status as captured by the Charlson Comorbidity Index, diabetes, heart failure, pulmonary disease, depression, and acute renal failure, Charlson comorbidity index, hospital ownership (eg, private), bed-size, teaching or nonteaching status, and urban/rural location, hospita/surgeon volume	Hazard ratio(CI)	1.84 (1.36-2.47)	patients with BMI of 50 or more had higher risk of Wound dehiscence than those with BMI of 40 to 49
Meller,M.M., 2016	Low Quality	Infection (PJI)	3 months	585127	Modifiable risk factor optimization (primary TKAs from Medicare claims data)	BMI of 50 or higher vs those without any BMI related diagnostic codes	age, gender, race, resident census region, economic status using state Medicaid buyin as a proxy, and overall health status as captured by the Charlson Comorbidity Index, diabetes, heart failure, pulmonary disease, depression, and acute renal failure, Charlson comorbidity index, hospital ownership (eg, private), bed-size, teaching or nonteaching status, and urban/rural location, hospita/surgeon volume	Hazard ratio(CI)	3.14 (2.33-4.22)	BMI over 50 had higher risk of PJI than non obese patients

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Meller,M.M., 2016	Low Quality	Infection (PJI)	3 months	585127	Modifiable risk factor optimization (primary TKAs from Medicare claims data)	BMI of 50 or higher vs. 40-49	age, gender, race, resident census region, economic status using state Medicaid buyin as a proxy, and overall health status as captured by the Charlson Comorbidity Index, diabetes, heart failure, pulmonary disease, depression, and acute renal failure, Charlson comorbidity index, hospital ownership (eg, private), bed-size, teaching or nonteaching status, and urban/rural location, hospita/surgeon volume	Hazard ratio(CI)	1.74 (1.27-2.38)	patients with BMI of 50 or more had higher risk of PJI than those with BMI of 40 to 49
Meller,M.M., 2016	Low Quality	Wound healing complication (Wound dehiscence)	3 months	585127	Modifiable risk factor optimization (primary TKAs from Medicare claims data)	BMI of 50 or higher vs those without any BMI related diagnostic codes	age, gender, race, resident census region, economic status using state Medicaid buyin as a proxy, and overall health status as captured by the Charlson Comorbidity Index, diabetes, heart failure, pulmonary disease, depression, and acute renal failure, Charlson comorbidity index, hospital ownership (eg, private), bed-size, teaching or nonteaching status, and urban/rural location, hospita/surgeon volume	Hazard ratio(CI)	4.22 (3.20-5.56)	BMI over 50 had higher risk of Wound dehiscence than non obese patients
Purcell,R.L., 2016	Low Quality	Wound healing complication (wound dehiscence)	Post-Op	1621	Modifiable risk factor optimization (THA)	bmi >= 35 vs < 35	none	relative risk, p-value	2.1, p= .256	NS
Purcell,R.L., 2016	Low Quality	Infection (PJI)	Post-Op	1621	Modifiable risk factor optimization (THA)	bmi >= 35 vs < 35	none	relative risk, p-value	7.1, p= .0044	Higher BMI associated with increased risk of PJI
Frisch,N., 2016	Low Quality	Infection (Deep surgical site infection)	Post-Op	896	Modifiable risk factor optimization (TKA)	THA	none	Cochran-Armitage test for trend p value	p=.043	higher BMI is associated with greater odds of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lubbeke,A., 2016	Moderate Quality	Infection (PJI)	Post-Op	12836	Modifiable risk factor optimization (all primary TKAs and THAs treated with antibiotic prophylaxis consisting of cefuroxime 30 min before surgery)	BMI 35 to 39.9 vs. under 25	age, sex, ASA score (ASA 1–2 vs. 3–4), presence of diabetes, smoking status, etiology of OA (primary vs. secondary), site of arthroplasty, use of antibiotic-laden cement, and length of operation	Hazard ratio(CI)	2.1 (1.1–4.3)	higher bmi increased the risk of PJI
Lubbeke,A., 2016	Moderate Quality	Infection (PJI)	Post-Op	11200	Modifiable risk factor optimization (all primary TKAs and THAs treated with antibiotic prophylaxis consisting of cefuroxime 30 min before surgery)	BMI 40 or more vs. under 25	age, sex, ASA score (ASA 1–2 vs. 3–4), presence of diabetes, smoking status, etiology of OA (primary vs. secondary), site of arthroplasty, use of antibiotic-laden cement, and length of operation	Hazard ratio(CI)	4.2 (1.8–9.7)	higher bmi increased the risk of PJI
Lubbeke,A., 2016	Moderate Quality	Infection (PJI)	Post-Op	17574	Modifiable risk factor optimization (all primary TKAs and THAs treated with antibiotic prophylaxis consisting of cefuroxime 30 min before surgery)	BMI 30 to 34.9 vs. under 25	age, sex, ASA score (ASA 1–2 vs. 3–4), presence of diabetes, smoking status, etiology of OA (primary vs. secondary), site of arthroplasty, use of antibiotic-laden cement, and length of operation	Hazard ratio(CI)	1.0 (0.6–1.8)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lubbeke,A., 2016	Moderate Quality	Infection (PJI)	Post-Op	6306	Modifiable risk factor optimization (all primary TKAs and THAs treated with antibiotic prophylaxis consisting of cefuroxime 30 min before surgery)	BMI 25 to 29.9 vs. under 25	age, sex, ASA score (ASA 1–2 vs. 3–4), presence of diabetes, smoking status, etiology of OA (primary vs. secondary), site of arthroplasty, use of antibiotic-laden cement, and length of operation	Hazard ratio(CI)	1.0 (0.6–1.7)	NS
Amlie,E., 2016	Low Quality	Infection (Revision due to PJI)	Post-Op	2931	Modifiable risk factor optimization (revision surgery THA)	BMI	age, sex	univariate, chi-squared, p-value	.67, p= .715	NS
Sousa,R.J., 2016	Low Quality	Infection (PJI)	1 Days	228	Modifiable risk factor optimization (elective primary THA or TKA)	bmi of 30 or more vs. under 30	surgery duration, obesity, diabetes, inflammatory arthritis, ASA score, patient S aureus carrier	logistic regression odds ratio(CI)	1.35(0.59-3.12)	NS
Lee,Q.J., 2015	Low Quality	Infection (PJI)	Post-Op	200	Modifiable risk factor optimization (Primary TKA)	Body mass index (kg/m^2)	age, gender, BMI, comorbidity (diabetes, liver disease, heart disease, anemia, thyroid disease, renal disease, lung disease, stroke, gout), varicose vein, steroid intake, dermatitis, acupuncture, bilateral TKA, same day surgery, anesthesia (spinal), continuous femoral nerve block, operating time, trainee surgeon, drain, intensive care unit admission, transfusion, large effusion, blister, soaked dressing, deep vein thrombosis, acute retention of urine, foley catheter, invasive procedure	multivariable logistic regression model; p value	0.367	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	4 Days	32582	Modifiable risk factor optimization (PJI Hip or Knee arthroplasty)	Obesity	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ration (95% CI), p-value	1.70 (1.38, 2.80) p= <.001	obesity increased risk of PJI
Chrastil,J., 2015	Low Quality	Infection (PJI)	Post-Op	13372	Modifiable risk factor optimization (diabetic primary THA or TKAs in the Department of Veteran Affairs Informatics and Computing Infrastructure (VINCI))	bmi of 30 or more vs. under 30	preop HbA1c, preop glucose, age, bmi, gender, charlson index, joint location, diabetic complications, smoking status. death outcome was incorporated as a competing risk	hazard ratio(CI)	0.992(0.713, 1.381)	NS
Alvi,H.M., 2015	Moderate Quality	Infection (deep incisional)	1 months	19305	Modifiable risk factor optimization (primary THA or TKA for osteoarthritis)	BMI 25 to 30 vs. 18.5 to 25	ASA class, age, gender, race, smoking, steroid use, hypertension medication, history of COPD, type of anesthesia used, pre-operative platelet count, white blood cell count, hematocrit levels, and CPT levels	Hazard ratio(CI)	0.73 (0.23, 2.27)	NS
Alvi,H.M., 2015	Moderate Quality	Infection (deep incisional)	1 months	17574	Modifiable risk factor optimization (primary THA or TKA for osteoarthritis)	BMI 30 to 35 vs. 18.5 to 25	ASA class, age, gender, race, smoking, steroid use, hypertension medication, history of COPD, type of anesthesia used, pre-operative platelet count, white blood cell count, hematocrit levels, and CPT levels	Hazard ratio(CI)	1.06 (0.38, 2.97)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Alvi,H.M., 2015	Moderate Quality	Infection (deep incisional)	1 months	11200	Modifiable risk factor optimization (primary THA or TKA for osteoarthritis)	BMI >40 vs. 18.5 to 25	ASA class, age, gender, race, smoking, steroid use, hypertension medication, history of COPD, type of anesthesia used, pre-operative platelet count, white blood cell count, hematocrit levels, and CPT levels	Hazard ratio(CI)	3.22 (1.34, 7.72)	BMI over 40 is associated with increased risk of deep incisional infection
Alvi,H.M., 2015	Moderate Quality	Infection (deep incisional)	1 months	12836	Modifiable risk factor optimization (primary THA or TKA for osteoarthritis)	BMI 35 to 40 vs. 18.5 to 25	ASA class, age, gender, race, smoking, steroid use, hypertension medication, history of COPD, type of anesthesia used, pre-operative platelet count, white blood cell count, hematocrit levels, and CPT levels	Hazard ratio(CI)	1.40 (0.52, 3.73)	NS
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Modifiable risk factor optimization (THA or TKA athroplasty)	Obesity	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	1.25 (1.17-1.33) p= <.001	obesity increased risk of PJI
Sousa,R., 2014	Low Quality	Infection (PJI)	Post-Op	2278	Modifiable risk factor optimization (THA and TKA patients.)	BMI of 30 or more vs less than 30	none	logistic regression odds ratio(CI)	0.99 (.69–1.41)	NS
Cai,J., 2014	Low Quality	Infection (PJI)	3 Days	903	Modifiable risk factor optimization (primary THA or TKA)	exact coding is unclear	Aquacel dressing, age, bmi, former smoker, thyroid disease, Liver Disease, History of Systemic steroid treatment.	logistic regression odds ratio(CI)	1.10(1.03,1.19)	higher BMI is associated with greater odds of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Modifiable risk factor optimization (patients undergoing THA or TKA)	BMI (>=28 kg/m2 vs. 18.5–28 kg/m2)	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	2.77 (1.20-6.40) p= .017	Patients more easily developed PJI if they had a history of high BMI
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	9901	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral TKA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention)	patients with 5% weight decrease in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	1.27 (0.66–2.42)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	5323	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral TKA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention. subgroup with initial bmi of 30-34)	patients with 5% weight increase in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	0.77 (0.22–2.74)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	5441	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral TKA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention. subgroup of patients who initial bmi was 30 to 34)	patients with 5% weight decrease in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	1.57 (0.56–4.43)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	1611	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral TKA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention. subgroup of patients with initial bmi of 40 or above)	patients with 5% weight decrease in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	2.27 (0.76–6.72)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	2849	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral TKA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention. subgroup of patients with initial bmi of 35-39)	patients with 5% weight decrease in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	0.62 (0.08–5.18)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	9386	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral TKA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention)	patients with 5% weight increase in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	1.59 (0.83–3.06)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	3808	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral THA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention)	patients with 5% weight decrease in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	1.83 (0.83–4.02)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	1405	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral TKA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention. subgroup with initial BMI of 40 or above)	patients with 5% weight increase in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	3.13 (0.95–10.30)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	2658	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral TKA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention. subgroup of patients with initial bmi of 35-39)	patients with 5% weight increase in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	1.07 (0.29–4.00)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Inacio,M.C., 2014	Low Quality	Infection (involves deep soft tissue)	1 Days	3334	Modifiable risk factor optimization (All obese (body mass index >=30 kg/m2) primary unilateral THA patients (no multiple joint surgery) who had the procedure performed for osteoarthritis, without any history of surgical weight loss intervention)	patients with 5% weight increase in the year before operation vs those who remained the same weight	bmi,gender,blood loss	logistic regression odds ratio(CI)	0.88 (0.20–3.81)	NS
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Modifiable risk factor optimization (Primary THA)	BMI of 35 or greater vs less than 35	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	2.12 (1.08-4.16) p= .0292	Patients with obesity more easily developed periprosthetic joint infections
Namba,R.S., 2013	Low Quality	Infection (deep)	Post-Op	56216	Modifiable risk factor optimization (primary elective total knee arthroplasties registered in the total joint replacement registry)	BMI of 35 or higher vs BMI under 35	age, sex, race, diabetes, bmi, ASA score, diagnosis, hospital and surgeon characteristics, bilateral surgery, anesthesia type, surgical exposure, antibiotic prophylaxis type	hazard ratio(CI)	1.47(1.17, 1.85)	higher bmi increased the risk of deep infection

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Hinarejos,P., 2013	Low Quality	Infection (deep)	Post-Op	2948	Modifiable risk factor optimization (TKA patients)	continuous	none	mean(SD) group1; mean(SD) group 2 (p value from mann whitney u test)	32.18 (6.17); 31.56(4.99) (p=.38)	NS
Namba,R.S., 2012	Low Quality	Infection (deep)	1 Days	30491	Modifiable risk factor optimization (primary elective THRs)	BMI 30-35 vs 18.5-30	ASA grade, bilateral surgery, sex, age, diabetes, BMI	Hazard ratio(CI)	1.56 (1.03 to 2.37)	pji risk was higher in the high bmi group
Namba,R.S., 2012	Low Quality	Infection (deep)	1 Days	30491	Modifiable risk factor optimization (primary elective THRs)	BMI 35 or greater vs 18.5-30	ASA grade, bilateral surgery, sex, age, diabetes, BMI	Hazard ratio(CI)	2.37 (1.55 to 3.61)	pji risk was higher in the high bmi group
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Modifiable risk factor optimization (Primary THA in the 5% national sample of the Medicare database)	obesity vs. no obesity	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.73 (1.35-2.22)	Obesity increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Modifiable risk factor optimization (Primary TKA in the 5% national sample of the Medicare database)	obesity vs. no obesity	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.22 (1.03–1.44)	obesity increased risk of PJI
Davis,A.M., 2011	Low Quality	Infection (deep, based on clinical and radiological grounds and confirmed by intraoperative culture during revi)	5 Days	1617	Modifiable risk factor optimization (primary unilateral THA for osteoarthritis)	continuous	Age, gender, prosthesis, operating consultant, preop HHS and SF-36 scores, cancer, atherosclerotic disease, cardiac disease, diabetes , osteoporosis, and phlebitis	% relative increase in odds per 10 point bmi increase(CI)	61.3(-52.1,450.6)	NS
McCalden,R.W., 2011	Low Quality	Infection (septic revision)	2.1 weeks	3290	Modifiable risk factor optimization (primary THA for osteoarthritis)	bmi comparisons: 40 or more vs 30-39 vs 25-29 vs less than 25	none	p value vrom kaplan meier analysis with breslow's rank test to compare survival curves from multiple groups	p=.045	patients with bmi of 40 or more had higher risk of revision than all other bmi groups

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Modifiable risk factor optimization (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	BMI continuous	none	univariate odds ratio(CI)	0.97 (0.93–1.02)	NS
Chee,Y.H., 2010	Low Quality	Infection (reoperation for deep infection)	5 Days	110	Modifiable risk factor optimization (THA for osteoarthritis. Two types of cemented femoral component were used: the Charnley THR and the Lubinus SPII)	morbidly obese patients (bmi over 40 or bmi over 36 with one comorbidity) vs non-obese patients	matched for age, gender, type of prosthesis, laterality (right or left, unilateral or bilateral) and pre-operative HHS	% risk difference with newcombe confidence intervals	3.636(-3.403,12.323)	NS
Gandhi,R., 2009	Low Quality	Infection (deep)	1 Days	1625	Modifiable risk factor optimization (THA with a diagnosis of primary or secondary osteoarthritis or rheumatoid arthritis)	continuous	antibiotic cement, age, sex, bmi, charlson index, education, preop womac score, Rheumatoid arthritis.	logistic regression odds ratio(CI)	1.0 (0.9,1.1)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lubbeke,A., 2008	Low Quality	Infection (PJI)	Post-Op	204	Modifiable risk factor optimization (revision THA)	BMI 30 or more vs less than 30	ASA score	odds ratio(exact CI)	3.021(0.392,23.3)	NS
Dowsey,M.M., 2008	Low Quality	Infection (PJI)	1 Days	1207	Modifiable risk factor optimization (Primary elective THA)	continuous	none	median BMI in infected patients/median BMI in non-infected patients(p value)	32/28 (p=.02)	BMI was higher in the infected group
Lubbeke,A., 2007	Low Quality	Infection (deep)	5 Days	2495	Modifiable risk factor optimization (primary THA)	bmi of 30 or more vs. under 30	age, sex, and diagnosis	incident rate ratio(CI)	5.1 (1.9, 13.5)	obese had higher risk of deep infection
Lubbeke,A., 2007	Low Quality	Infection (deep)	5 Days	2495	Modifiable risk factor optimization (male primary THA patients)	bmi of 30 or more vs. under 30	stratified by sex	incident rate ratio(CI)	1.0 (0.2, 5.3)	NS
Lubbeke,A., 2007	Low Quality	Infection (revision for septic loosening)	5 Days	1382	Modifiable risk factor optimization (female primary THA patients)	bmi of 30 or more vs. under 30	stratified by sex	% risk difference with newcombe score confidence intervals	1.045(0.273,3.028)	NS
Lubbeke,A., 2007	Low Quality	Infection (revision for septic loosening)	5 Days	2495	Modifiable risk factor optimization (male primary THA patients)	bmi of 30 or more vs. under 30	stratified by sex	odds ratio with exact confidence intervals	0.895(0.017,11.195)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lubbeke,A., 2007	Low Quality	Infection (deep)	5 Days	2495	Modifiable risk factor optimization (female primary THA patients)	bmi of 30 or more vs. under 30	stratified by sex	incident rate ratio(CI)	16.1 (3.4, 75.7)	female patients were at higher risk of deep infection if they were obese
Namba,R.S., 2005	Low Quality	Infection (reoperation for infection)	1 Days	1071	Modifiable risk factor optimization (THA)	BMI over 35 vs 35 or less	none	odds ratio with exact confidence intervals	4.16(0.345,36.627)	NS
Lehman,D.E., 1994	Low Quality	Wound healing complication (Delayed wound healing)	Post-Op	202	Modifiable risk factor optimization (uncemented THA)	bmi of 30 or more vs. under 30	none	odds ratio with exact confidence intervals	0.586(0.012,6.088)	NS
Hanna,S.A., 2017	Low Quality	Revision (re-revision for deep infection)	Post-Op	112	Modifiable risk factor optimization (revision THA patients)	BMI over 40 vs 30-40	matched by age, gender, date of index surgery	% events in morbid obese;%events in non-morbid obese (p value from kaplan meier)	4%;2% (p=.039)	morbid obesity increased risk of revision for deep infection
Chen,A.F., 2017	Low Quality	Infection (PJI)	Post-Op	32580	Modifiable risk factor optimization (primary or revision TJA.)	BMI	bmi, comorbidity, length of stay,	Adjusted odds ratio (CI) p-value	1.03 (1.02- 1.04) p-<.001	BMI increased odds of PJI

Table 2: Cardiac disease

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Non-Modifiable risk factors (patients underwent THA or TKA)	Mycardial infarction	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	1.48 (.60-3.64) p= .40	NS
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Non-Modifiable risk factors (patients underwent THA or TKA)	Congestive heart failure	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	1.23(.45-3.38) p= .69	NS
Long,G., 2016	Low Quality	Infection (PJI)	Post-Op	906	Non-Modifiable risk factors (TKA)	atrial fibrillation vs no atrial fibrillation	matched by age, gender, BMI	odds ratio(95% CI)	2.10(1.84-2.40)	atrial fibrillation increased risk of PJI
Lee,Q.J., 2015	Low Quality	Infection (PJI)	Post-Op	200	Non-Modifiable risk factors (Primary TKA)	heart disease	age, gender, BMI, comorbidity (diabetes, liver disease, heart disease, anemia, thyroid disease, renal disease, lung disease, stroke, gout), varicose vein, steroid intake, dermatitis, acupuncture, bilateral TKA, same day surgery, anesthesia (spinal), continuous femoral nerve block, operating time, trainee surgeon, drain, intensive care unit admission, transfusion, large effusion, blister, soaked dressing, deep vein thrombosis, acute retention of urine, foley catheter, invasive procedure	multivariable logistic regression model; odds ratio (95% CI), p value	5.13 (1.14- 23.10) p= .020	Heart disease is a risk factor for PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	4 Days	32582	Non-Modifiable risk factors (PJI Hip or Knee arthroplasty)	Cardiologic devices	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ration (95% CI), p-value	1.13 (.77, 1.65) p= .55	NS
Tabatabaee,R.M., 2015	Low Quality	Wound healing complication (hematoma and/or seroma)	Discharge	1584411	Non-Modifiable risk factors (primary or revision THA or TKA in National In-Patient Sample database)	patients with a history of coronary angioplasty and/or stenting vs. patients without a history of coronary revascularization	Elixhauser comorbidities, type of TJA, type of insurance, age, gender, race, year of surgery, cardiac dysrhythmias (atrial fibrillation and other arrhythmias), and hospital size, type, and setting.	p value from logistic regression	p>.05	NS
Tabatabaee,R.M., 2015	Low Quality	Wound healing complication (hematoma and/or seroma)	Discharge	1584745	Non-Modifiable risk factors (primary or revision THA or TKA in National In-Patient Sample database)	coronary artery bypass graft (CABG) vs. patients without a history of coronary revascularization	Elixhauser comorbidities, type of TJA, type of insurance, age, gender, race, year of surgery, cardiac dysrhythmias (atrial fibrillation and other arrhythmias), and hospital size, type, and setting.	logistic regression odds ratio(CI)	.81(0.72,0.91)	risk was lower in patients with history of coronary artery bypass graft

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Non-Modifiable risk factors (patients undergoing THA or TKA)	cardiovascular event in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	1.32 (.39- 4.52) p=.654	NS
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Non-Modifiable risk factors (Primary THA)	Ischemic heart disease	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	.71 (.31-.64) p= .4239	NS
Aggarwal,V.K., 2013	Low Quality	Infection (hospital readmission fo PJI)	Post-Op	222	Non-Modifiable risk factors (aseptic primary or revision total joint arthroplasty)	atrial fibrillation vs no atrial fibrillation	age, sex, involved joint (hip or knee), laterality, procedure type (primary or revision),body mass index (BMI), surgeon, postoperative prophylaxis against deep-vein thrombosis, and approximate date of surgery	odds ratio with exact confidence intervals	27.251(3.63,1213.126)	atrial fibrillation increased odds of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	Valvular disease vs. no Valvular disease	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	0.96 (0.79-1.16)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	ischemic heart disease vs. no ischemic heart disease	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	0.99 (0.85-1.16)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	cardiac arrythmia vs. no cardiac arrythmia	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.30 (1.11-1.52)	cardiac arrythmia increased risk of PJI
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	congestive heart failure vs. no congestive heart failure	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.22 (1.01-1.48)	congestive heart failure increases risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	congestive heart failure vs. no congestive heart failure	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.28 (1.13–1.46)	congestive heart failure increased risk of PJI
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	Valvular disease vs. no Valvular disease	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.15 (1.01–1.31)	Valvular disease increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	ischemic heart disease vs. no ischemic heart disease	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.11 (1.00–1.23)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	cardiac arrhythmia vs. no cardiac arrhythmia	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.11 (0.99–1.24)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	cardiac disease vs no cardiac disease	none	univariate odds ratio(CI)	1.38 (0.71–2.66)	NS
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	cerebrovascular disease vs no cerebrovascular disease	none	univariate odds ratio(CI)	1.23 (0.15–10.09)	NS
Dowsey,M.M., 2009	Low Quality	Infection (PJI)	1 Days	1214	Non-Modifiable risk factors (elective TKA)	cardiovascular disease vs no cardiovascular disease	cardiovascular disease, diabetes, respiratory disease, smoking, obesity, Rheumatoid arhtritis, transfusion, drain tube, antibiotic cement, gender, age	logistic regression odds ratio(CI)	1.92(0.40–9.19)	NS
Dowsey,M.M., 2008	Low Quality	Infection (PJI)	1 Days	1207	Non-Modifiable risk factors (Primary elective THA)	cardiac disease vs no cardiac disease	none	odds ratio(exact confidence intervals)	1.379(0.524,4.029)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Honkanen,M., 2017	Low Quality	Infection (PJI)	1 Days	20226	Non-Modifiable risk factors (primary Hip or Knee replacement)	chronic heart disease vs no chronic heart disease	peroperative bacteriuria, Gender, joint site, age, chronic heart disease, chronic lung disease, hypertension, malignancy, neurologic or psychologic disorder, rheumatoid diseaes	logistic regression odds ratio(CI)	0.58(0.28,1.21)	NS

Table 3: Immunocompromised Other

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Non-Modifiable risk factors (patients underwent THA or TKA)	Tumor or leukemia or lymphoma	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	2.47 (1.45- 4.22) p= .001	Tumor or leukemia or lymphoma increased risk of PJI
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Non-Modifiable risk factors (patients underwent THA or TKA)	Malignant Tumor	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	1.3 (.007- 23.05) p= .86	NS
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	Post-Op	32582	Non-Modifiable risk factors (PJI Hip or Knee arthroplasty)	Cancer	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ration (95% CI), p-value	1.02 (.74, 1.41) p= .89	NS
Cai,J., 2014	Low Quality	Infection (PJI)	3 Days	903	Non-Modifiable risk factors (primary THA or TKA)	history of systemic steroid treatment	Aquacel dressing, age, bmi, former smoker, thyroid disease, Liver Disease, History of Systemic steroid treatment.	logistic regression odds ratio(CI)	22.22(1.83,269.45)	Age significantly increases odds of PJI
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Non-Modifiable risk factors (patients undergoing THA or TKA)	Oncologic disease	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	.90 (.08-10.69) p= .936	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	metastatic tumor vs. no metastatic tumor	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.40 (0.91-2.15)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	lymphoma vs. no lymphoma	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.39 (0.81-2.36)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	malignancy vs. no malignancy	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.13 (0.97-1.31)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	metastatic tumor vs. no metastatic tumor	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.59 (1.03–2.47)	metastatic tumors increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	lymphoma vs. no lymphoma	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.34 (0.85–2.11)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	malignancy vs. no malignancy	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.07 (0.95–1.20)	NS
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	Cancer vs no Cancer	none	univariate odds ratio(CI)	1.70 (0.7–3.86)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Hailer,N.P., 2010	Low Quality	Infection (revision for infection)	Post-Op	170413	Non-Modifiable risk factors (totally cemented or totally uncemented THAs in Swedish HIp Arthroplasty Register)	operation for tumor vs operation for osteoarthritis	primary diagnosis, age, sex, cemented vs uncemented fixation	Hazard ratio(CI)	1.7 (0.5 –5.3)	NS
Berbari,E.F., 1998	Low Quality	Infection (PJI)	Post-Op	924	Non-Modifiable risk factors (THA or TKA)	systemic malignancy vs no systemic malignancy	matched by gender, joint location, controlled in model for age, date of prosthesis, postoperative SSI, NNIS surgical risk index score, systemic malignancy, prior joint arthroplasty, prior joint arthroplasty. unclear which of the other variables were screened out of stepwise model	matched conditional logistic regression odds ratio(CI)	3.1(1.3-7.2)	systemic malignancy increased odds of PJI
Honkanen,M., 2017	Low Quality	Infection (PJI)	1 Days	20226	Non-Modifiable risk factors (primary Hip or Knee replacement)	Malignancy vs no Malignancy	peroperative bacteriuria, Gender, joint site, age, chronic heart disease, chronic lung disease, hypertension, malignancy, neurologic or psychologic disorder, rheumatoid diseaes	logistic regression odds ratio(CI)	0.55(0.17,1.72)	NS

Table 4: Immunocompromised transplant

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Klement,M.R., 2016	Low Quality	Infection (PJI overall time point)	Post-Op	2321	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Kidney transplant	age, gender	relative risk, p-value	1.56,p=<0.001	kidney transplant increased risk of PJI
Klement,M.R., 2016	Low Quality	Infection (PJI overall time point)	Post-Op	561	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Liver transplant	age, gender	relative risk, p-value	1.6,p=0.022	Liver transplant increased risk of PJI
Klement,M.R., 2016	Low Quality	Infection (PJI overall time point)	Post-Op	196	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Lung transplant	age, gender	relative risk, p-value	0.99,p=0.988	NS
Klement,M.R., 2016	Low Quality	Infection (PJI overall time point)	Post-Op	428	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Heart transplant	age, gender	relative risk, p-value	1.82,p=0.006	Heart transplant increased risk of PJI
Klement,M.R., 2016	Low Quality	Infection (PJI overall time point)	Post-Op	149	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Pancreas transplant	age, gender	relative risk, p-value	1.31,p=0.543	NS
Klement,M.R., 2016	Low Quality	Infection (PJI)	3 months	428	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Heart transplant	age, gender	relative risk, p-value	2.32,p=0.004	heart increased risk of PJI
Klement,M.R., 2016	Low Quality	Infection (PJI)	3 months	149	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Pancreas transplant	age, gender	relative risk, p-value	3.03,p=0.009	pancreas increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Klement,M.R., 2016	Low Quality	Infection (PJI)	3 months	2321	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Kidney transplant	age, gender	relative risk, p-value	1.32,p=0.099	NS
Klement,M.R., 2016	Low Quality	Infection (PJI)	3 months	561	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Liver transplant	age, gender	relative risk, p-value	2.09,p=0.006	liver transplant increased risk of PJI
Klement,M.R., 2016	Low Quality	Infection (PJI)	3 months	196	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	Lung transplant	age, gender	relative risk, p-value	2.3,p=0.054	NS
Klement,M.R., 2016	Low Quality	Infection (PJI)	3 months	2321	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	any organ transplant	age, gender	relative risk, p-value	1.7 p<.001	any organ transplant increased risk of PJI
Klement,M.R., 2016	Low Quality	Infection (PJI overall time point)	3 months	2321	Non-Modifiable risk factors (THA patients after one or more solid organ transplant)	any organ transplant	age, gender	relative risk, p-value	1.67 p<.001	any organ transplant increased risk of PJI
Cavanaugh,P.K., 2015	Low Quality	Wound healing complication (wound complications in hospital)	Post-Op	2579694	Non-Modifiable risk factors (primary or revision TKA or THA)	heart,lung or pancreas transplant vs no transplant	demographics (specfic one not listed), hospital region, setting and size, primary payer, year of surgery, underlying joint disorder, type of TJA (revision versus primary) and type of joint (knee versus hip)	logistic regression odds ratio(CI)	2.13(1.27–3.58)	having a heart, lung or pancrease transplant increased odds of wound complications
Cavanaugh,P.K., 2015	Low Quality	Wound healing complication (wound complications in hospital)	Post-Op	2579823	Non-Modifiable risk factors (primary or revision TKA or THA)	Liver transplant vs no transplant	demographics (specfic one not listed), hospital region, setting and size, primary payer, year of surgery, underlying joint disorder, type of TJA (revision versus primary) and type of joint (knee versus hip)	p value from logistic regression	p>.05	NS

Table 5: Peripheral vascular disease

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Non-Modifiable risk factors (patients underwent THA or TKA)	Peripheral vascular disease	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	.88 (.40-1.93) p= .75	NS
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Non-Modifiable risk factors (THA or TKA athroplasty)	Peripheral vascular disease	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	1.34 (1.16-1.55) p= <.001	PVD increased risk of PJI
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Non-Modifiable risk factors (Primary THA)	Peripheral vascular	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	2.3 (.63-8.4) p= .2077	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	peripheral vascular disease vs. no peripheral vascular disease	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.29 (1.09-1.54)	PVD increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	peripheral vascular disease vs. no peripheral vascular disease	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.13 (1.01–1.27)	peripheral vascular disease increased risk of PJI
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	vascular arterial disease vs vascular arterial disease	none	univariate odds ratio(CI)	0.51 (0.18–1.47)	NS
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	Vascular venous disease vs no Vascular venous disease	none	univariate odds ratio(CI)	1.39 (0.47–4.15)	NS

Table 6: Presence of inflammatory arthritis with or without the use of biologics/immune modulating drugs

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
George,M.D., 2017	Moderate Quality	Infection (pji)	1 Days	4288	Non-Modifiable risk factors (elective primary or revision hip or knee arthroplasty. patients had rheumatoid arthritis (RA), inflammatory bowel disease (IBD), psoriasis (PsO), psoriatic arthritis (PsA), or ankylosing spondylitis (AS), and all had had received at least one infliximab infusion within 6 months before surgery)	stoping infliximab 4-8 weeks before surgery vs. 8-12 weeks before surgery	propensity score matching with: age, use of methotrexate in past 3 months, sex, race, RA, inflamatory bowel disease, psoriatic/ankylosis, extra articular ra, diabetes, COPD, kidney disease, obesity, charlson score, non-biologic DMARD in past 3 months, previous biologic DMARD, glucocorticoid dose in past month, surgery type.	odds ratio(CI)	.95(.62-1.36)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
George,M.D., 2017	Moderate Quality	Infection (pji)	1 Days	4288	Non-Modifiable risk factors (elective primary or revision hip or knee arthroplasty. patients had rheumatoid arthritis (RA), inflammatory bowel disease (IBD), psoriasis (PsO), psoriatic arthritis (PsA), or ankylosing spondylitis (AS), and all had had received at least one infliximab infusion within 6 months before surgery)	stoping infliximab at least 16 weeks before surgery vs. 8-12 weeks before surgery	propensity score matching with: age, use of methotrexate in past 3 months, sex, race, RA, inflamatory bowel disease, psoriatic/ankylosis, extra articular ra, diabetes, COPD, kidney disease, obesity, charlson score, non-biologic DMARD in past 3 months, previous biologic DMARD, glucocorticoid dose in past month, surgery type.	odds ratio(CI)	1.22(.49-3.02)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
George,M.D., 2017	Moderate Quality	Infection (pji)	1 Days	4288	Non-Modifiable risk factors (elective primary or revision hip or knee arthroplasty. patients had rheumatoid arthritis (RA), inflammatory bowel disease (IBD), psoriasis (PsO), psoriatic arthritis (PsA), or ankylosing spondylitis (AS), and all had had received at least one infliximab infusion within 6 months before surgery)	stoping infliximab <4 weeks before surgery vs. 8-12 weeks before surgery	propensity score matching with: age, use of methotrexate in past 3 months, sex, race, RA, inflamatory bowel disease, psoriatic/ankylosis, extra articular ra, diabetes, COPD, kidney disease, obesity, charlson score, non-biologic DMARD in past 3 months, previous biologic DMARD, glucocorticoid dose in past month, surgery type.	odds ratio(CI)	.9(.6-1.34)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
George,M.D., 2017	Moderate Quality	Infection (pji)	1 Days	4288	Non-Modifiable risk factors (elective primary or revision hip or knee arthroplasty. patients had rheumatoid arthritis (RA), inflammatory bowel disease (IBD), psoriasis (PsO), psoriatic arthritis (PsA), or ankylosing spondylitis (AS), and all had had received at least one infliximab infusion within 6 months before surgery)	stoping infliximab 12-16 weeks before surgery vs. 12-16 weeks before surgery	propensity score matching with: age, use of methotrexate in past 3 months, sex, race, RA, inflamatory bowel disease, psoriatic/ankylosis, extra articular ra, diabetes, COPD, kidney disease, obesity, charlson score, non-biologic DMARD in past 3 months, previous biologic DMARD, glucocorticoid dose in past month, surgery type.	odds ratio(CI)	1.06(.54-2.05)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Triantafyllopoulos,G.K., 2016	Low Quality	Infection (pji)	Post-Op	6650	Non-Modifiable risk factors (primary bilateral THAs (either same day or staged))	inflammatory arthritis vs. degenerative arthrits	was a stepwise model with patient demographics (ie, age, sex), Deyo comorbidity index, total LOS, diagnosis, blood transfusion, allogeneic transfusion, and total number of transfusions as candidate predictors, but the exact variables in the final model was unclear	logistic regression odds ratio(CI)	7.321(1.912, 28.028)	patient with inflammatory arthritis had increased odds of pji
Sousa,R.J., 2016	Low Quality	Infection (PJI)	1 Days	228	Non-Modifiable risk factors (elective primary THA or TKA)	elective surgery for inflammatory arthritis vs elective surgery without inflammatory arthritis	surgery duration, obesity, diabetes, inflammatory arthritis, ASA score, patient S aureus carrier	logistic regression odds ratio(CI)	3.25 (0.87-2.14)	NS
Schrama,J.C., 2015	Low Quality	Infection (revision due to infection)	Post-Op	390671	Non-Modifiable risk factors (primary THAs for OA or RA in Nordic Arthroplasty Register Association (NARA) registry)	RA vs OA (not stratified by biologic use, since they didn't have data to directly measure used in patients)	age,sex,diagnosis, year of primary surgery (before or after 2001), fixation type	cox proportional hazard ratio(CI)	1.3 (>1.0–1.6)	Rheumatoid arthritis increased risk of revision for infection compared to OA patients

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Non-Modifiable risk factors (patients undergoing THA or TKA)	RA vs OA	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	2.81 (.69-11.47) p= .151	NS
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Non-Modifiable risk factors (Primary THA)	Rheumatologic disease	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	1.37 (.57- 2.39) p=.4785	NS
Dale,H., 2012	Low Quality	Infection (revision for infection)	Post-Op	113280	Non-Modifiable risk factors (primary THAs in Nordic Arthroplasty Register Association dataset)	inflammatory disease vs. osteoarthritis	age, sex, diagnosis, prosthesis type, fixation type, cement type, cement with antibiotics	Hazard ratio(CI)	1.4(1.1–1.7)	patient with inflammatory arthritis had increased odds of pji

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	Rheumatic disease vs. no Rheumatic disease	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.71 (1.42-2.06)	Rheumatic disease increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	Rheumatologic disease vs. no Rheumatologic disease	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.18 (1.02–1.37)	Rheumatologic disease increased risk of PJI
Pedersen,A.B., 2010	Low Quality	Infection (revision for infection)	2 weeks	80756	Non-Modifiable risk factors (Primary THA in Danish Hip Arthroplasty Registry)	inflammatory arthritis vs. osteoarthritis	sex, age, charlson index, primary diagnosis, previsous surgery on the same hip, fixation technique, operating theater ventilation, ansethesia typ, ossification prophylaxis with NSAIDs, duration of surgery	hazard ratio(CI)	1.19 (0.76–1.88)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	inflamatory arthritis vs no inflammatory arthritis	none	univariate odds ratio(CI)	2.78 (1.19–6.48)	inflammatory arthritis increases odds of infection
Schrama,J.C., 2010	Low Quality	Infection (revision for infection at 1 year)	1 Days	24294	Non-Modifiable risk factors (All primary TKA patients with RA or OA The Norwegian Arthroplasty Register (NAR))	Rheumatoid arthritis vs osteoarthritis	age, sex, year of primary surgery	hazard ratio(p value)	1.8(p<.05)	RA increased the risk of revision for infection
Schrama,J.C., 2010	Low Quality	Infection (revision for infection between 1 and 6 years)	6 Days	24294	Non-Modifiable risk factors (All primary TKA patients with RA or OA The Norwegian Arthroplasty Register (NAR))	Rheumatoid arthritis vs osteoarthritis	age, sex, year of primary surgery	hazard ratio(p value)	1.1(p>.05)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Schrama,J.C., 2010	Low Quality	Infection (revision for infection at 6 or more years after surgery)	Post-Op	24294	Non-Modifiable risk factors (All primary TKA patients with RA or OA The Norwegian Arthroplasty Register (NAR))	Rheumatoid arthritis vs osteoarthritis	age, sex, year of primary surgery	hazard ratio(CI)	5.4(1.9–16)	RA increased the risk of revision for infection
Schrama,J.C., 2010	Low Quality	Infection (revision for infection at 1 year)	1 Days	84492	Non-Modifiable risk factors (All primary THA patients with RA or OA The Norwegian Arthroplasty Register (NAR))	Rheumatoid arthritis vs osteoarthritis	age, sex, year of primary surgery	hazard ratio(p value)	1(p>.05)	NS
Schrama,J.C., 2010	Low Quality	Infection (revision for infection between 1 and 6 years)	6 Days	84492	Non-Modifiable risk factors (All primary THA patients with RA or OA The Norwegian Arthroplasty Register (NAR))	Rheumatoid arthritis vs osteoarthritis	age, sex, year of primary surgery	hazard ratio(p value)	.8(p>.05)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Schrama,J.C., 2010	Low Quality	Infection (revision for infection at 6 or more years after surgery)	Post-Op	84492	Non-Modifiable risk factors (All primary THA patients with RA or OA The Norwegian Arthroplasty Register (NAR))	Rheumatoid arthritis vs osteoarthritis	age, sex, year of primary surgery	hazard ratio(CI)	4.1(1.6–11)	RA increased risk of revision for infection
Hailer,N.P., 2010	Low Quality	Infection (revision for infection)	Post-Op	170413	Non-Modifiable risk factors (totally cemented or totally uncemented THAs in Swedish HIp Arthroplasty Register)	RA vs OA	primary diagnosis, age, sex, cemented vs uncemented fixation	Hazard ratio(CI) (p value)	1.4 (1.0 –1.9) (p=.04)	RA patients were at higher risk of revision for infection
Jamsen,E., 2010	Low Quality	Infection (PJI)	1 Days	2495	Non-Modifiable risk factors (primary elective knee arthroplasty)	RA vs OA	age,sex,diagnosis, ASA score, BMI, preop knee society score, preop KSS pain, preop range of motion, fixation method, length of operation, blood loss.	logistic regression odds ratio(CI)	2.99(0.84-10.56)	NS
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Non-Modifiable risk factors (Primary THAs in the Norwegian Arthroplasty Register)	inflammatory arthritis vs osteoarthritis	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI)	1.1(0.7–1.7)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Gandhi,R., 2009	Low Quality	Infection (deep)	1 Days	1625	Non-Modifiable risk factors (THA with a diagnosis of primary or secondary osteoarthritis or rheumatoid arthritis)	RA vs OA	antibiotic cement, age, sex, bmi, charlson index, education, preop womac score, Rheumatoid arthritis.	logistic regression odds ratio(CI)	0.5 (0.1,2.0)	NS
Bongartz,T., 2008	Low Quality	Infection (PJI)	Post-Op	701	Non-Modifiable risk factors (primary and revision THA and TKAs for Osteoarthritis or Rheumatoid Arthritis)	rheumatoid arthritis vs osteoarthritis	matching was performed according to patient age (w/in 5 years), site (hip or knee), type (revision/primary arthroplasty), and time point of first Mayo surgery	Hazard ratio(CI)	4.08(1.35–12.33)	RA patients were at higher risk of infection
Bongartz,T., 2008	Low Quality	Infection (PJI)	Post-Op	462	Non-Modifiable risk factors (primary and revision THA and TKAs for Rheumatoid Arthritis)	DMARDs withheld within 3 months of surgery vs DMARDs not witheld	none	Hazard ratio(CI)	0.65(0.09–4.95)	NS
Soriano,A., 2008	Low Quality	Infection (deep tissue)	1 Days	908	Non-Modifiable risk factors (Primary TKA)	proportion with rheumatoid arthritis in infected vs uninfected patients	none	proportion infected/proportion uninfected (p value from chi square test)	3.6%/1.1%(p=.34)	NS
Kreder,H.J., 2003	Low Quality	Infection (readmission for knee infection)	3 Days	14352	Non-Modifiable risk factors (elective TKA)	inflammatory arthritis vs osteoarthritis	hospital volume, surgeon volume, age, charlson comorbidity index, OA vs RA, gender	generalized estimating equation odds ratio(CI)	1.33(0.83,2)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kreder,H.J., 2003	Low Quality	Infection (readmission for knee infection)	1 Days	14352	Non-Modifiable risk factors (elective TKA)	inflammatory arthritis vs osteoarthritis	hospital volume, surgeon volume, age, charlson comorbidity index, OA vs RA, gender	generalized estimating equation odds ratio(CI)	1.82(1.11,3.33)	inflammatory arthritis increased odds of PJI
Wilson,M.G., 1990	Low Quality	Infection (deep)	Post-Op	3933	Non-Modifiable risk factors (metal to plastic TKAs with OA or RA)	RA vs OA	none	odds ratio(CI)	2.55 (1.44, 4.53)	RA increased odds of PJI
Salvati,E.A., 1982	Low Quality	Infection (postoperative wound infection)	Post-Op	3175	Non-Modifiable risk factors (Total hip and knee replacements)	rheumatoid arthritis vs other diagnosis	none	correlation, p	.03, < .03	Rheumatoid arthritis showed significant correlation with postoperative infection rate
Honkanen,M., 2017	Low Quality	Infection (PJI)	1 Days	20226	Non-Modifiable risk factors (primary Hip or Knee replacement)	Rheumatic disease vs. no Rheumatic disease	peroperative bacteriuria, Gender, joint site, age, chronic heart disease, chronic lung disease, hypertension, malignancy, neurologic or psychologic disorder, rheumatoid diseaes	logistic regression odds ratio(CI)	0.61(0.23,1.67)	NS

Table 7: Prior joint infection

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bedair,H., 2015	Moderate Quality	Infection (pji)	Post-Op	180	Non-Modifiable risk factors (patients getting a second arthroplasty at a different hip or knee joint site)	patients with previous PJI on a separate joint undergoing a 2nd primary hip or knee arthroplasty an a separate vs. those undergoing a seperate joint arthroplasty without a history of pji in a separate joint	matched by age at the time of the initial surgery (± 2 years), sex, history of diabetes mellitus, body mass index,ASA score,joints replaced, institution, and year of second arthroplasty surgery	relative risk(CI)	21(1.25–353.08)	patients who had pji in a separate hip/knee joint have a higher risk of pji in other joints
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	infection as the reason for revision vs aseptic reasons	diagnosis other than osteoarthritis at the time of primary TKA, higher Charlson index, and revision for infection. the following were entered into a stepwise analysis, but it is unclear which variables were retained in final model:medical comorbidities (in particular connective tissue disorder and respiratory disease), diagnosis other than osteoarthritis at the time of primary TKA, revision for infection, abnormal serology at the time of revision arthroplasty, and one-stage surgical treatment for infection (irrigation and de´bridement or one-stage exchange arthroplasty	logistic odds ratio(CI)	2.24(1.31–3.82)	patients revised for infection have greater odds of infection after revision than aseptic revisions

Table 8: Renal disease

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Non-Modifiable risk factors (patients underwent THA or TKA)	Kidney disease	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	.74 (.38-1.44) p= .37	NS
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	26262	Non-Modifiable risk factors (THA patients in a Medicare database)	chronic kidney disease and diabetes vs. healthy controls	matched by age and gender	odds ratio(95% CI)	3.96(3.68, 4.26)	combined diabetes and CKD increased odds of PJI compared to healthy controls
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	2525	Non-Modifiable risk factors (THA patients in a Medicare database)	diabetes and hemodialysis vs. healthy controls	matched by age and gender	odds ratio(95% CI)	4.47(3.66, 5.47)	diabetic hemodialysis patients were at increased odds of PJI compared to healthy controls
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	902	Non-Modifiable risk factors (THA patients in a Medicare database)	renal transplantation and diabetes vs healthy contol	matched by age and gender	odds ratio(95% CI)	1.45(1.04, 2.04)	diabetic renal transplant patients were at increased odds of PJI compared to healthy controls
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	26262	Non-Modifiable risk factors (THA patients in a Medicare database)	chronic kidney disease and diabetes vs. healthy controls	matched by age and gender	odds ratio(95% CI)	4.19(3.58, 4.91)	combined diabetes and CKD increased odds of PJI compared to healthy controls

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	2525	Non-Modifiable risk factors (THA patients in a Medicare database)	diabetes and hemodialysis vs. healthy controls	matched by age and gender	odds ratio(95% CI)	6.61(4.25, 10.27)	diabetic hemodialysis patients were at increased odds of PJI compared to healthy controls
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	902	Non-Modifiable risk factors (THA patients in a Medicare database)	renal transplantation and diabetes vs healthy contol	matched by age and gender	odds ratio(95% CI)	1.12(0.60, 2.07)	NS
Tan,T.L., 2016	Low Quality	Infection (revision for PJI)	3 months	12308	Non-Modifiable risk factors (priprimary TJAs (6361 hips and 5947 knees) with abailable preoperative renal function parameters. CKD stages were defined based on eGFR in mL/min/1.73 m2 (eGFR): (1) 90þ, (2) 60-89, (3A) 45-59, (3B) 30-44, (4) 15-29, and (5) <15.)	stage 4 or 5 vs. stage 1 or 2	age, gender, body mass index, race,Elixhauser comorbidity index, preoperative angiotensin-converting enzyme inhibitor, NSAID consumption	logistic regression odds ratio(p value)	0.95(p= .962)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Tan,T.L., 2016	Low Quality	Infection (revision for PJI)	2 Days	12308	Non-Modifiable risk factors (priprimary TJAs (6361 hips and 5947 knees) with abailable preoperative renal function parameters. CKD stages were defined based on eGFR in mL/min/1.73 m2 (eGFR): (1) 90þ, (2) 60-89, (3A) 45-59, (3B) 30-44, (4) 15-29, and (5) <15.)	stage 4 or 5 vs. stage 1 or 2	age, gender, body mass index, race,Elixhauser comorbidity index, preoperative angiotensin-converting enzyme inhibitor, NSAID consumption	logistic regression odds ratio(p value)	OR, 1.31(p= .714)	NS
Tan,T.L., 2016	Low Quality	Infection (revision for PJI)	3 months	12308	Non-Modifiable risk factors (priprimary TJAs (6361 hips and 5947 knees) with abailable preoperative renal function parameters. CKD stages were defined based on eGFR in mL/min/1.73 m2 (eGFR): (1) 90þ, (2) 60-89, (3A) 45-59, (3B) 30-44, (4) 15-29, and (5) <15.)	stage 3B vs. stage 1 or 2	age, gender, body mass index, race,Elixhauser comorbidity index, preoperative angiotensin-converting enzyme inhibitor, NSAID consumption	logistic regression odds ratio(p value)	1.37(p=.532)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Tan,T.L., 2016	Low Quality	Infection (revision for PJI)	2 Days	12308	Non-Modifiable risk factors (priprimary TJAs (6361 hips and 5947 knees) with abailable preoperative renal function parameters. CKD stages were defined based on eGFR in mL/min/1.73 m2 (eGFR): (1) 90þ, (2) 60-89, (3A) 45-59, (3B) 30-44, (4) 15-29, and (5) <15.)	stage 3B vs. stage 1 or 2	age, gender, body mass index, race,Elixhauser comorbidity index, preoperative angiotensin-converting enzyme inhibitor, NSAID consumption	logistic regression odds ratio(p value)	1.71(p=.159)	NS
Tan,T.L., 2016	Low Quality	Infection (revision for PJI)	3 months	12308	Non-Modifiable risk factors (priprimary TJAs (6361 hips and 5947 knees) with abailable preoperative renal function parameters. CKD stages were defined based on eGFR in mL/min/1.73 m2 (eGFR): (1) 90þ, (2) 60-89, (3A) 45-59, (3B) 30-44, (4) 15-29, and (5) <15.)	stage 3A vs. stage 1 or 2	age, gender, body mass index, race,Elixhauser comorbidity index, preoperative angiotensin-converting enzyme inhibitor, NSAID consumption	logistic regression odds ratio(p value)	2.18(p=.004)	Stage 3A patients were at higher risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Tan,T.L., 2016	Low Quality	Infection (revision for PJI)	2 Days	12308	Non-Modifiable risk factors (priprimary TJAs (6361 hips and 5947 knees) with abailable preoperative renal function parameters. CKD stages were defined based on eGFR in mL/min/1.73 m2 (eGFR): (1) 90þ, (2) 60-89, (3A) 45-59, (3B) 30-44, (4) 15-29, and (5) <15.)	stage 3A vs. stage 1 or 2	age, gender, body mass index, race,Elixhauser comorbidity index, preoperative angiotensin-converting enzyme inhibitor, NSAID consumption	logistic regression odds ratio(p value)	2(p=.002)	Stage 3A patients were at higher risk of PJI
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	1184	Non-Modifiable risk factors (male primary TKAs)	chronic kidney disease vs no kidney disease	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	1.44 (0.62–3.38)	NS
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	3435	Non-Modifiable risk factors (female primary TKAs)	chronic kidney disease vs no chronic kidney disease	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	1.70 (0.83–3.49)	NS
Lee,Q.J., 2015	Low Quality	Infection (PJI)	Post-Op	200	Non-Modifiable risk factors (Primary TKA)	renal disease	age, gender, BMI, comorbidity (diabetes, liver disease, heart disease, anemia, thyroid disease, renal disease, lung disease, stroke, gout), varicose vein, steroid intake, dermatitis, acupuncture, bilateral TKA, same day surgery, anesthesia (spinal), continuous femoral nerve block, operating time, trainee surgeon, drain, intensive care unit admission, transfusion, large effusion, blister, soaked dressing, deep vein thrombosis, acute retention of urine, foley catheter, invasive procedure	multivariable logistic regression model; p value	0.444	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	4 Days	32582	Non-Modifiable risk factors (PJI Hip or Knee arthroplasty)	Chronic renal failure	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ration (95% CI), p-value	1.53 (1.11, 2.10) p= .01	chronic renal failure increased risk of PJI
Miric,A., 2014	Moderate Quality	Infection (deep)	Post-Op	20720	Non-Modifiable risk factors (primary elective THA patients in the total foint replacement registry)	chronic kidney disease vs no kidney disease	diabetes,age, gender, race, ASA	hazard ratio(CI)	1.14(0.56–2.33)	NS
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Non-Modifiable risk factors (patients undergoing THA or TKA)	renal disease in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	1.43 (.43-4.80) p =.559	NS
Miric,A., 2014	Moderate Quality	Infection (deep)	Post-Op	44538	Non-Modifiable risk factors (primary TKAs in Total Joint Replacement Registry)	chronic renal disease vs no chronic renal disease.	age, sex, race/ethnicity, American Society of Anaesthesiologists scores, surgery indication (osteoarthritis vs. other diagnosis), and comorbidities (diabetes, heart failure, valvular disease, peripheral vascular disease, alcohol abuse, and hypertension).	logistic regression odds ratio(CI)	1.01 0.65–1.58	NS
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Non-Modifiable risk factors (Primary THA)	renal disease	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	.25 (.06-1.1) p= .0735	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	renal disease vs. no renal disease	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.19 (0.86-1.65)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	renal disease vs. no renal disease	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.38 (1.11–1.71)	renal disease increased risk of PJI
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	renal disease vs no renal disease	none	univariate odds ratio(CI)	2.89 (0.58–14.36)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Erkocak,O.F., 2016	Low Quality	Infection (PJI)	Post-Op	1061	Non-Modifiable risk factors (THA or TKA)	Chronic Renal Failure vs. No Chronic Renal Failure	matched by gender, age, date of surgery, BMI	odds ratio(CI)	1.26 0.55-4.93	NS
Kuo,L.-T., 2017	Low Quality	Infection (PJI)	Post-Op	13844	Non-Modifiable risk factors (Diabetic patients with TKA)	chronic kidney disease vs no kidney disease	age, gender, comorbidity	hazard ratio(CI)	1.31 (0.94–1.82)	NS
Kuo,L.-T., 2017	Low Quality	Infection (requiring debridement)	Post-Op	13844	Non-Modifiable risk factors (Diabetic patients with TKA)	chronic kidney disease vs no kidney disease	age, gender, comorbidity	hazard ratio(CI)	1.18 (0.77–1.80)	NS
Kuo,L.-T., 2017	Low Quality	Infection (requiring implant removal)	Post-Op	13844	Non-Modifiable risk factors (Diabetic patients with TKA)	chronic kidney disease vs no kidney disease	age, gender, comorbidity	hazard ratio(CI)	1.76 (0.80–3.85)	NS

Table 9: ESRD (kidney failure)

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Deegan,B.F., 2014	Low Quality	Infection (joint infection)	Post-Op	225	Non-Modifiable risk factors (Patients included in the study were adults (>=18 years) who underwent THA and were previously diagnosed as having stage 1 to 3 chronic kidney disease, based on the presence of proteinuria, as well as 2 elevated glomerular filtration rates separated by at least 90 days.)	stage 3 kidney disease vs stage 1 to 2	age, sex, BMI, joint replaced	cox proportional hazard ratio(CI)	0.50 (0.09-2.75)	NS
Deegan,B.F., 2014	Low Quality	Infection (joint infection)	Post-Op	779	Non-Modifiable risk factors (Patients included in the study were adults (>=18 years) who underwent THA or TKA and were previously diagnosed as having stage 1 to 3 chronic kidney disease, based on the presence of proteinuria, as well as 2 elevated glomerular filtration rates separated by at least 90 days.)	stage 3 kidney disease vs stage 1 to 2	age, sex, BMI, joint replaced	cox proportional hazard ratio(CI)	0.47 (0.21-1.06)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Deegan,B.F., 2014	Low Quality	Infection (joint infection)	Post-Op	554	Non-Modifiable risk factors (Patients included in the study were adults (>=18 years) who underwent TKA and were previously diagnosed as having stage 1 to 3 chronic kidney disease, based on the presence of proteinuria, as well as 2 elevated glomerular filtration rates separated by at least 90 days.)	stage 3 kidney disease vs stage 1 to 2	age, sex, BMI, joint replaced	cox proportional hazard ratio(CI)	0.47 (0.19-1.17)	NS
Deegan,B.F., 2014	Low Quality	Wound healing complication (hematoma)	Post-Op	779	Non-Modifiable risk factors (Patients included in the study were adults (>=18 years) who underwent THA or TKA and were previously diagnosed as having stage 1 to 3 chronic kidney disease, based on the presence of proteinuria, as well as 2 elevated glomerular filtration rates separated by at least 90 days.)	stage 3 kidney disease vs stage 1 to 2	none	events g1/N1; events g2/N2 (chi square p value)	5/377;6/402(p=.884)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Miric,A., 2014	Moderate Quality	Infection (deep infections. all were revised. quality = Low due to no confounding adjustment)	Post-Op	922	Non-Modifiable risk factors (primary elective THA patients in the total foint replacement registry)	stage 5 vs stage 3	none	odds ratio (exact CI)	1.489(0.033,11.824)	NS
Miric,A., 2014	Moderate Quality	Infection (deep infections. all were revised. quality = Low due to no confounding adjustment)	Post-Op	134	Non-Modifiable risk factors (primary elective THA patients in the total foint replacement registry)	stage 5 vs stage 4	none	% risk difference with newcombe score confidence intervals	1.235(-5.6,6.667)	NS

Table 10: Liver disease all

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Non-Modifiable risk factors (patients underwent THA or TKA)	Chronic Liver disease	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	2.09 (1.12-3.90) p= .02	chronic liver disease increased risk of PJI
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Non-Modifiable risk factors (patients underwent THA or TKA)	Moderate or severe liver disease	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	.88 (.16-4.78) p= .88	NS
Lee,Q.J., 2015	Low Quality	Infection (PJI)	Post-Op	200	Non-Modifiable risk factors (Primary TKA)	liver disease	age, gender, BMI, comorbidity (diabetes, liver disease, heart disease, anemia, thyroid disease, renal disease, lung disease, stroke, gout), varicose vein, steroid intake, dermatitis, acupuncture, bilateral TKA, same day surgery, anesthesia (spinal), continuous femoral nerve block, operating time, trainee surgeon, drain, intensive care unit admission, transfusion, large effusion, blister, soaked dressing, deep vein thrombosis, acute retention of urine, foley catheter, invasive procedure	multivariable logistic regression model; odds ratio (95% CI), p value	3.27 (.36-29.84) p= .268	NS
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	4 Days	32582	Non-Modifiable risk factors (PJI Hip or Knee arthroplasty)	Liver disease	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ratio (95% CI), p-value	2.88 (1.88, 4.42) p= <.001	liver disease increased risk of PJI
Cai,J., 2014	Low Quality	Infection (PJI)	3 Days	903	Non-Modifiable risk factors (primary THA or TKA)	Liver Disease vs. No Liver Disease	Aquacel dressing, age, bmi, former smoker, thyroid disease, Liver Disease, History of Systemic steroid treatment.	logistic regression odds ratio(CI)	7.03(1.43-34.60)	Liver Disease increases the odds of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Non-Modifiable risk factors (patients undergoing THA or TKA)	chronic liver disease in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	1.34 (.36-5.04) p= .663	NS
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Non-Modifiable risk factors (Primary THA)	chronic liver disease	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	1.02 (.29-3.74) p= .9756	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	chronic liver disease vs. no chronic liver disease	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.02 (0.69-1.50)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	chronic liver disease vs. no chronic liver disease	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.08 (0.84–1.39)	NS
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	liver disease vs no liver disease	none	univariate odds ratio(CI)	2.60 (0.83–8.15)	NS

Table 11: Liver disease cirrhosis

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	3435	Non-Modifiable risk factors (female primary TKAs)	Cirrhosis vs no Cirrhosis	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	1.50 (0.53–4.25)	NS
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	1184	Non-Modifiable risk factors (male primary TKAs)	Cirrhosis vs no Cirrhosis	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	1.07 (0.32–3.61)	NS
Deleuran,T., 2015	Moderate Quality	Infection (deep prosthetic joint infection)	1 Days	109522	Non-Modifiable risk factors (THA and TKA osteoarthritis patients in Danish hip and knee registries from 1995-2011.)	Cirrhosis vs no Cirrhosis	patient characteristics (age, gender, CCI, and number of inpatient hospitalizations in the year preceding arthroplasty) or procedural characteristics (operation site (hip or knee), type of anesthesia (regional or general), and year of operation. analysis also used death as a competing risk	hazard ratio(CI)	2.1(1.3–3.7)	Cirrhosis increased the risk of PJI
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Non-Modifiable risk factors (THA or TKA athroplasty)	Liver cirrhosis	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	2.42 (1.87-3.12), p= <.001	Cirrhosis increased the risk of PJI

Table 12: Liver disease Hepatitis

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	1184	Non-Modifiable risk factors (male primary TKAs)	hepatitis C vs no Hepatitis C	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	1.06 (0.25–4.45)	NS
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	3435	Non-Modifiable risk factors (female primary TKAs)	Hepatitis b vs no Hepatitis b	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	0.68 (0.17–2.81)	NS
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	1184	Non-Modifiable risk factors (male primary TKAs)	Hepatitis b vs no Hepatitis b	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	4.32 (1.85–10.09)	males with hepatitis b were at increased risk of PJI
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	3435	Non-Modifiable risk factors (female primary TKAs)	hepatitis C vs no Hepatitis C	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	1.24 (0.49–3.19)	NS
Best,M.J., 2015	Low Quality	Infection (in hospital Infection of device (icd9 996.66))	Discharge	8363326	Non-Modifiable risk factors (primary THA or TKA patients in National Hospital Discharge Survey)	hepatitis C vs no Hepatitis C	None	%events grp1; %events grp2 (chi square p value)	.84%;.09% (p<.001)	Hepatitis C increased the risk of joint infection
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Non-Modifiable risk factors (THA or TKA athroplasty)	Hepatitis B (no Cirrhosis)	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	1.22 (.77-1.95) p= <.401	NS
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Non-Modifiable risk factors (THA or TKA athroplasty)	Hepatitis A (no Cirrhosis)	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	2.33 (1.97-2.76) p= <.001	Hepatitis A increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Pour,A.E., 2011	Low Quality	Wound healing complication (persistent wound drainage)	Post-Op	215	Non-Modifiable risk factors (THA or TKA)	seropositive hepatitis c vs. seronegative hepatitis C	age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)	logistic regression odds ratio(CI)	2.48 0.8 to 7.67	NS
Pour,A.E., 2011	Low Quality	Wound healing complication (persistent wound drainage)	Post-Op	96	Non-Modifiable risk factors (TKA for degenerative arthritis)	seropositive hepatitis c vs. seronegative hepatitis C	age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)	odds ratio with exact confidence intervals	0.659(0.012,8.595)	NS
Pour,A.E., 2011	Low Quality	Infection (deep infection requiring revision)	Post-Op	96	Non-Modifiable risk factors (TKA for degenerative arthritis)	seropositive hepatitis c vs. seronegative hepatitis C	age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)	% risk difference with newcombe score confidence intervals	-1.562(-8.334,9.232)	NS
Pour,A.E., 2011	Low Quality	Wound healing complication (persistent wound drainage)	Post-Op	119	Non-Modifiable risk factors (THA)	seropositive hepatitis c vs. seronegative hepatitis C	age, body-mass index, sex, year of surgery, and medical comorbidities (including diabetes, rheumatoid arthritis, and immunosuppressive conditions)	logistic regression odds ratio(CI)	4.52(1.06 to 19.2)	hepatitis C increased risk of persistent wound drainage.
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	1446	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent TKA)	Hepatitis B vs no Hepatitis B	age, gender, comorbidity	odds ratio (95% CI) p-value	1.96 (1.53- 2.50) p- 0	hepatitis B increased odds of PJI
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	1446	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent TKA)	Hepatitis B vs no Hepatitis B	age, gender, comorbidity	odds ratio (95% CI) p-value	1.93 (1.66- 2.25) p- 0	hepatitis B increased odds of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	4200	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent THA)	Hepatitis C vs. No Hepatitis C	age, gender comorbidity	odds ratio (95% CI) p-value	1.92 (1.54- 2.38) p- 0	hepatitis c increased odds of PJI
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	4200	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent THA)	Hepatitis C vs. No Hepatitis C	age, gender, comorbidity	odds ratio (95% CI) p-value	1.79 (1.54- 2.08) p- 0	hepatitis c increased odds of PJI
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	1446	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent THA)	Hepatitis B vs no Hepatitis B	age, gender, comorbidity	odds ratio (95% CI) p-value	1.79 (1.20- 2.65) p- .0045	hepatitis B increased odds of PJI
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	1446	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent THA)	Hepatitis B vs no Hepatitis B	age, gender, comorbidity	odds ratio (95% CI) p-value	2.07 (1.61- 2.66) p- 0	hepatitis B increased odds of PJI
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	4200	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent TKA)	Hepatitis C vs. No Hepatitis C	age, gender, comorbidity	odds ratio (95% CI) p-value	2.38 (2.08- 2.73) p- 0	hepatitis c increased odds of PJI
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	4200	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent TKA)	Hepatitis C vs. No Hepatitis C	age, gender, comorbidity	odds ratio (95% CI) p-value	2.07 (1.09- 2.26) p- 0	hepatitis c increased odds of PJI

Table 13: Mental health

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Non-Modifiable risk factors (Primary THA)	Depression	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	1.96 (1.10-3.49) p= .022	Patients with depression more easily developed periprosthetic joint infections
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	depression vs. no depression	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.38 (1.11-1.72)	depression increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	psychosis vs. no psychosis	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.48 (1.13-1.94)	psychoses increase risk of PJI
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	depression vs. no depression	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.28 (1.08–1.51)	depression increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	psychoses vs. no psychoses	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.26 (1.02–1.57)	psychoses increased risk of PJI

Table 14: Alcohol

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	4 Days	32582	Modifiable risk factor optimization (PJI Hip or Knee arthroplasty)	Alcohol abuse	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ration (95% CI), p-value	2.47 (1.67, 3.63) p= <.001	alcohol abuse increased risk of PJI
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Modifiable risk factor optimization (THA or TKA athroplasty)	Alcohol abuse	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	1.64 (1.38-1.95) p= <.001	alcohol abuse increased risk of PJI
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Modifiable risk factor optimization (patients undergoing THA or TKA)	alcohol abuse in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	2.95 (1.06-8.23) p= .039	Patients more easily developed PJI if they had a history of alcohol abuse

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Modifiable risk factor optimization (Primary THA in the 5% national sample of the Medicare database)	alcohol abuse vs. no alcohol abuse	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.72 (0.98-3.01)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Modifiable risk factor optimization (Primary TKA in the 5% national sample of the Medicare database)	alcohol abuse vs. no alcohol abuse	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.11 (0.63–1.97)	NS
Rotevatn,T.A., 2017	Low Quality	Infection (PJI)	1 Days	30799	Modifiable risk factor optimization (TKA or THA)	alcohol consumption of 0 to 168 g/week vs no alcohol use	age,sex, smoking status, BMI, annual income, Charlson Comorbidity Index, American Society of Anesthesiologists physical status classification, operation type and preoperative use of methotrexate	Hazard ratio (95% CI) p-value	.91 (.75 - 1.11) p- .3630	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Rotevatn,T.A., 2017	Low Quality	Infection (PJI)	1 Days	30799	Modifiable risk factor optimization (TKA or THA)	alcohol consumption of 168 - 252 g/week vs no alcohol use	age,sex, smoking status, BMI, annual income, Charlson Comorbidity Index, American Society of Anesthesiologists physical status classification, operation type and preoperative use of methotrexate	Hazard ratio (95% CI) p-value	1.55 (1.13 - 2.13) p-.0072	alcohol consumption if 168 to 252g per week increased risk of pji
Rotevatn,T.A., 2017	Low Quality	Infection (PJI)	1 Days	30799	Modifiable risk factor optimization (TKA or THA)	alcohol consumption of 252 g/week vs no alcohol use	age,sex, smoking status, BMI, annual income, Charlson Comorbidity Index, American Society of Anesthesiologists physical status classification, operation type and preoperative use of methotrexate	Hazard ratio (95% CI) p-value	1.10 (.80 - 1.52) p-.5519	NS

Table 15: Anemia

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lee,Q.J., 2015	Low Quality	Infection (PJI)	Post-Op	200	Modifiable risk factor optimization (Primary TKA)	Anemia	age, gender, BMI, comorbidity (diabetes, liver disease, heart disease, anemia, thyroid disease, renal disease, lung disease, stroke, gout), varicose vein, steroid intake, dermatitis, acupuncture, bilateral TKA, same day surgery, anesthesia (spinal), continuous femoral nerve block, operating time, trainee surgeon, drain, intensive care unit admission, transfusion, large effusion, blister, soaked dressing, deep vein thrombosis, acute retention of urine, foley catheter, invasive procedure	multivariable logistic regression model; odds ratio (95% CI), p value	12.4 (1.99-77.32) p= .001	Anemia is a risk factor for PJI
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Modifiable risk factor optimization (patients undergoing THA or TKA)	anemia in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	.74 (.17-3.26) p =.688	NS
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Modifiable risk factor optimization (Primary THA)	Anemia	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	.62 (.194-1.97) p= .4179	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Greenky,M., 2012	Moderate Quality	Infection (PJI)	Post-Op	15221	Modifiable risk factor optimization (primary TKA and THA)	anemia (females 12 g/dL males 13 g/dL) vs no anemia	the propensity score adjusted model controlled for variables found significant in univariate model, but the specific variables were not specified	logistic regression odds ratio(CI)	1.95 (1.41–2.69)	anemia increased the odds of pji
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Modifiable risk factor optimization (Primary THA in the 5% national sample of the Medicare database)	preoperative anemia vs. no preoperative anemia	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.36 (1.15-1.62)	preoperative anemia increased risk of pji
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Modifiable risk factor optimization (Primary TKA in the 5% national sample of the Medicare database)	preoperative anemia vs. no preoperative anemia	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.26 (1.09–1.45)	anemia increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Pulido,L., 2008	Low Quality	Infection (PJI)	5 Days	9245	Modifiable risk factor optimization (primary hip or knee arthroplasty)	preop anemia vs no preop anemia	variables considered for stepwise model:race, physical status score (ASA), body mass index, rheumatoid arthritis, venous thromboembolism, anemia, hypercholesterolemia, dementia, knee arthroplasty, simultaneous bilateral surgery, operative time, hospital length, postoperative creatinine, allogenic transfusion, postoperative atrial fibrillation, postoperative myocardial infarction, postoperative urinary tract infection, postoperative wound drainage, postoperative hematoma	stepwise logistic regression p value	p>.05	NS
Lu,M., 2017	Low Quality	Infection (deep infection)	1 months	6830	Modifiable risk factor optimization (revision THA and TKA patients in ACS-NSQIP data base)	Anemia vs no Anemia	gender, age, functional status, ASA class, hypertension, diabetes, chronic obstructive pulmonary disease, dyspnea, congestive heart failure, dialysis, steroid use, and bleeding disorders	OR (95% CI) p-value	1.68 (1.19-2.38) p- .003	anemia increased the odds of deep infection

Table 16: Smoking/tobacco use

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Long,G., 2016	Low Quality	Infection (PJI)	Post-Op	906	Modifiable risk factor optimization (TKA)	Smoking	diabetes, atrial fibrilation type, smoking. unclear if other confounder variables were included in the model due to unclear model building description	odds ratio(95% CI), p value	3.2012 (2.8242-3.6154) p=0.0025	smoking increased risk of PJI
Crowe,B., 2015	Low Quality	Infection (PJI)	1 Days	3419	Modifiable risk factor optimization (Primary TKA)	tobacco use within last month vs no tobacco use in the last month	gender, S. aureus Colonization, pulmonary disease, tobacco use, unclear if other covariates were included in the model or were screened out due to non significance.	logistic regression odds ratio(CI)	3.07(1.02–9.37)	tobacco use increased the risk of pji
Crowe,B., 2015	Low Quality	Infection (PJI)	1 Days	3419	Modifiable risk factor optimization (Primary TKA)	combined effect of smoking and a bmi of 40 or more	unclear	logistic regression odds ratio(CI)	5.97(.74–47.89)	NS
Crowe,B., 2015	Low Quality	Infection (PJI)	1 Days	3419	Modifiable risk factor optimization (Primary TKA)	combined effect of smoking and a bmi of 30 or more	unclear	logistic regression odds ratio(CI)	8.37(1.86–37.74)	smoking and have bmi of 30 or mor increases risk of PJI
Debreuve-Theresette,A., 2015	Low Quality	Infection (deep)	1 Days	135	Modifiable risk factor optimization (primary and reivsion THA and THA patients)	smoker vs non smoker	matched by type of prosthesis, primary or revision procedure type; regression controlled for obesity, number of prior surgeries on joint, smoking, Inflammatory rheumatism	conditional logistic regression odds ratio(CI)	3.91 (1.19–12.84)	smoking increased risk of deep infection
Singh,J.A., 2015	Low Quality	Infection (revision for infection)	Post-Op	7926	Modifiable risk factor optimization (primary THA or TKA patients at Mayo Clinic)	current smoker vs former or never smoker	joint, sex, age	hazard ratio(CI) (p value_	2.28 (0.99, 5.27) (p=.05)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Singh,J.A., 2015	Low Quality	Infection (deep)	Post-Op	7926	Modifiable risk factor optimization (primary THA or TKA patients at Mayo Clinic)	current smoker vs former or never smoker	joint, sex, age	hazard ratio(CI)	2.37 (1.19, 4.72)	current smokers were at increased risk of deep infection
Chrastil,J., 2015	Low Quality	Infection (PJI)	Post-Op	13372	Modifiable risk factor optimization (diabetic primary THA or TKAs in the Department of Veteran Affairs Informatics and Computing Infrastructure (VINCI))	ever smoked vs never smoked	preop HbA1c, preop glucose, age, bmi, gender, charlson index, joint location, diabetic complications, smoking status. death outcome was incorporated as a competing risk	hazard ratio(CI)	1.157(0.898, 1.491)	NS
Duchman,K.R., 2015	Low Quality	Wound healing complication (wound dehiscence)	1 months	70129	Modifiable risk factor optimization (primary total hip or total knee arthroplasty in ACS NSQIP database)	former smokers vs never smoked	None	Risk Ratio (CI)	2.98 (1.86, 4.75)	former smokers were at increased risk of wound dehiscence
Duchman,K.R., 2015	Low Quality	Infection (deep wound)	1 months	70129	Modifiable risk factor optimization (primary total hip or total knee arthroplasty in ACS NSQIP database)	former smokers vs never smoked	None	Risk Ratio (CI)	1.35 (0.89, 2.05)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Duchman,K.R., 2015	Low Quality	Infection (deep wound)	1 months	14220	Modifiable risk factor optimization (primary total hip or total knee arthroplasty in ACS NSQIP database)	current smokers vs former smokers	None	Risk Ratio (CI)	1.71 (1.07, 2.74)	current smokers were at increased risk for deep wound infection compared to former smokers.
Duchman,K.R., 2015	Low Quality	Wound healing complication (wound dehiscence)	1 months	14220	Modifiable risk factor optimization (primary total hip or total knee arthroplasty in ACS NSQIP database)	current smokers vs former smokers	None	Risk Ratio (CI)	1.02 (0.55, 1.87)	NS
Duchman,K.R., 2015	Low Quality	Infection (deep wound)	1 months	72033	Modifiable risk factor optimization (primary total hip or total knee arthroplasty in ACS NSQIP database)	current smokers vs never smoked	None	Risk Ratio (CI)	2.31 (1.72, 3.11)	Current smokers were at increased risk of deep wound infection
Duchman,K.R., 2015	Low Quality	Wound healing complication (wound dehiscence)	1 months	72033	Modifiable risk factor optimization (primary total hip or total knee arthroplasty in ACS NSQIP database)	current smokers vs never smoked	None	Risk Ratio (CI)	2.92 (1.73, 4.93)	current smokers were at increased risk of wound dehiscence

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Modifiable risk factor optimization (THA or TKA athroplasty)	Smoking	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	1.03 (.96- 1.09) p=.424	NS
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Modifiable risk factor optimization (patients undergoing THA or TKA)	tobacco use in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	1.29 (.35-4.76) p=.703	NS
Lombardi,A.V.,Jr., 2013	Low Quality	Infection (failure(revision or removal of the acetabular shell) due to infection)	Post-Op	256	Modifiable risk factor optimization (complex primary and revision THA with ultraporous acetabular reconstruction)	current smoker vs prior smoker	none	odds ratio (exact CI)	2.283(0.634,8.51)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lombardi,A.V.,Jr., 2013	Low Quality	Infection (failure(revision or removal of the acetabular shell) due to infection)	Post-Op	360	Modifiable risk factor optimization (complex primary and revision THA with ultraporous acetabular reconstruction)	current smoker vs. never smoker	none	odds ratio (exact CI)	5.663(1.399,27.056)	current smokers at greater odds of failure due to infection then never smokers
Dowsey,M.M., 2009	Low Quality	Infection (PJI)	1 Days	1214	Modifiable risk factor optimization (elective TKA)	smoker vs non smoker	cardiovascular disease, diabetes, respiratory disease, smoking, obesity, Rheumatoid arhtritis, transfusion, drain tube, antibiotic cement, gender, age	logistic regression odds ratio(CI)	2.31(0.44–12.14)	NS
Dowsey,M.M., 2008	Low Quality	Infection (PJI)	1 Days	1207	Modifiable risk factor optimization (Primary elective THA)	smokers vs non smokers	none	odds ratio(exact confidence intervals)	0.317(0.008,1.997)	NS
Sahota,S., 2018	Low Quality	Infection (deep soft tissues or any part of the anatomy (eg, organs or spaces))	1 months	1916	Modifiable risk factor optimization (primary THA)	smoked cigarettes in past year vs no smoking in past years	propensity score adjusted for several variables, but unclear what variables were included in propensity analysis	odds ratio(exact CI)	8.084(1.078,359.198)	current smokers at increased odds of deep infection
Sahota,S., 2018	Low Quality	Infection (deep soft tissues or any part of the anatomy (eg, organs or spaces))	1 months	2502	Modifiable risk factor optimization (primary TKA and TKA)	smoked cigarettes in past year vs no smoking in past years	propensity score adjusted for several variables, but unclear what variables were included in propensity analysis	relative risk(CI)	4.67(1.34, 16.20)	current smokers at increased risk of deep infection
Sahota,S., 2018	Low Quality	Infection (deep soft tissues or any part of the anatomy (eg, organs or spaces))	1 months	1306	Modifiable risk factor optimization (primary TKA)	smoked cigarettes in past year vs no smoking in past years	propensity score adjusted for several variables, but unclear what variables were included in propensity analysis	odds ratio(exact CI)	3.016(0.537,30.667)	NS

Table 17: Malnutrition

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wagner,E.R., 2016	Moderate Quality	Infection (deep)	Post-Op	22289	Modifiable risk factor optimization (Primary TKA)	BMI less than 18 vs. 18 to 24.99	age, sex, surgical indication, and time period of the surgical procedure	Hazard ratio(CI)	1.96 (0.42 to 9.14)	NS
Kamath,A.F., 2016	Low Quality	Infection (deep organ space)	Post-Op	4551	Modifiable risk factor optimization (Revision TKA from ACS-NSQIP registry)	less than 3.5 vs. albumin at 3.5 or above	age, sex, race, ASA classification, year of surgery, and CCI score	logistic regression odds ratio(CI)	3.79(2.31–6.21)	albumin less than 3.5 increased odds of deep organ space infection
Kamath,A.F., 2016	Low Quality	Wound healing complication (Wound disruption)	Post-Op	4551	Modifiable risk factor optimization (Revision TKA from ACS-NSQIP registry)	less than 3.5 vs. albumin at 3.5 or above	age, sex, race, ASA classification, year of surgery, and CCI score	logistic regression odds ratio(CI)	1.46(0.51–4.16)	NS
Kamath,A.F., 2016	Low Quality	Infection (deep incisional)	Post-Op	4551	Modifiable risk factor optimization (Revision TKA from ACS-NSQIP registry)	less than 3.5 vs. albumin at 3.5 or above	age, sex, race, ASA classification, year of surgery, and CCI score	logistic regression odds ratio(CI)	2.30(1.15–4.60)	albumin less than 3.5 increased odds of deep incisional infection
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	4 Days	32582	Modifiable risk factor optimization (PJI Hip or Knee arthroplasty)	Undernutriotion	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ration (95% CI), p-value	1.59 (1.16, 2.20) p= .01	undernutrition increased risk of PJI
Zorrilla,P., 2006	Low Quality	Wound healing complication (Delayed wound healing)	Post-Op	80	Modifiable risk factor optimization (THA for primary osteoarthritis or osteoarthritis secondary to avascular necrosis)	preoperative zinc level low vs high (continuous variable)	Total lymphocyte count, zinc level	logistic regression odds ratio	1.11(1.04–1.19)	for every 1 mg/dL decrease in zinc level, odds of delayed wound healing increased by 11%

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Zorrilla,P., 2006	Low Quality	Wound healing complication (Delayed wound healing)	Post-Op	80	Modifiable risk factor optimization (THA for primary osteoarthritis or osteoarthritis secondary to avascular necrosis)	continuous difference in Serum transferrin between those with and without delayed wound healing	none	mean difference (p value from t test)	-13.55 (p=.301)	NS
Zorrilla,P., 2006	Low Quality	Wound healing complication (Delayed wound healing)	Post-Op	80	Modifiable risk factor optimization (THA for primary osteoarthritis or osteoarthritis secondary to avascular necrosis)	continuous difference in albumin levels between those with and without delayed wound healing	none	mean difference (p value from t test)	-0.42 (p=.068)	NS
Manrique,J., 2017	Low Quality	Infection (deep infection)	Post-Op	108	Modifiable risk factor optimization (primary unilateral TKA)	underweight BMI less than 18.5 vs normal weight BMI 18.5-24	age, gender, date of surgery	odds ratio(95% CI), p value	23.3 (1.2-466.5) p = .04	being underweight increased risk of deep infection

Table 18: Diabetes

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kao,F.C., 2017	Low Quality	Infection (PJI)	Post-Op	13026	Modifiable risk factor optimization (patients underwent THA or TKA)	diabetes uncomplicated	Age, gender, comorbidity	multivariate linear modeling, adjusted hazard ratio (95% CI)	.87(.56- 1.37) p= .56	NS
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	61778	Modifiable risk factor optimization (THA patients in a Medicare database)	diabetes vs. no diabetes	matched by age and gender	odds ratio(95% CI)	2.85(2.54, 3.19)	diabetes increased the odds of PJI
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	61778	Modifiable risk factor optimization (THA patients in a Medicare database)	diabetes vs. no diabetes	matched by age and gender	odds ratio(95% CI)	2.40(2.28, 2.53)	diabetes increased the odds of PJI
Long,G., 2016	Low Quality	Infection (PJI)	Post-Op	906	Modifiable risk factor optimization (TKA)	diabetes mellitus	diabetes, atrial fibrilation type, smoking. unclear if other confounder variables were included in the model due to unclear model building description	odds ratio(95% CI), p value	3.5025 (3.1200-3.9242) p=0.0042	diabetes increased risk of PJI
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	3435	Modifiable risk factor optimization (female primary TKAs)	diabetes vs. no diabetes	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	1.35 (0.92–1.98)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kuo,S.J., 2016	Low Quality	Infection (PJI)	Post-Op	1184	Modifiable risk factor optimization (male primary TKAs)	diabetes vs. no diabetes	hepatits b, age, diabetes, cirrhosis, chronic kidney disease, hepatitis c	Hazard ratio(CI)	2.21 (1.34–3.64)	male diabetics were at increased risk of pji compared to non diabetics
Watts,C.D., 2016	Low Quality	Infection (PJI)	Post-Op	1814	Modifiable risk factor optimization (TKA)	Diabetic	age, BMI, sex	Hazard ratio (95% CI) p-value	.8 (.5-1.3) p=.34	NS
Sousa,R.J., 2016	Low Quality	Infection (PJI)	1 Days	228	Modifiable risk factor optimization (elective primary THA or TKA)	diabetes vs. no diabetes	surgery duration, obesity, diabetes, inflammatory arthritis, ASA score, patient S aureus carrier	logistic regression odds ratio(CI)	1.50(0.60-3.73)	NS
Crowe,B., 2015	Low Quality	Infection (PJI)	1 Days	3419	Modifiable risk factor optimization (Primary TKA)	diabetes complications vs no diabetes complications	none	logistic regression odds ratio(CI)	0.99 (0.99–1.0)	NS
Lee,Q.J., 2015	Low Quality	Infection (PJI)	Post-Op	200	Modifiable risk factor optimization (Primary TKA)	diabetes mellitus	age, gender, BMI, comorbidity (diabetes, liver disease, heart disease, anemia, thyroid disease, renal disease, lung disease, stroke, gout), varicose vein, steroid intake, dermatitis, acupuncture, bilateral TKA, same day surgery, anesthesia (spinal), continuous femoral nerve block, operating time, trainee surgeon, drain, intensive care unit admission, transfusion, large effusion, blister, soaked dressing, deep vein thrombosis, acute retention of urine, foley catheter, invasive procedure	multivariable logistic regression model; odds ratio (95% CI), p value	6.07 (1.43- 25.75) p= .006	Diabetes mellitus is a risk factor for PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	4 Days	32582	Modifiable risk factor optimization (PJI Hip or Knee arthroplasty)	Diabetes mellitus	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ration (95% CI), p-value	.90 (.71, 1.14) p=.37	NS
Maradit,Kremers H., 2015	Low Quality	Infection (PJI)	1 Days	20171	Modifiable risk factor optimization (THA and TKA procedures (both primary and revision) performed at the Mayo Clinic)	diabetes vs no diabetes	Age, Gender, BMI, Type of Surgery, ASA, Operative Time ,Diabetes	logistic regression odds ratio(CI)	1.23 (0.87, 1.74)	NS
Maradit,Kremers H., 2015	Low Quality	Infection (PJI)	1 Days	1407	Modifiable risk factor optimization (THA and TKA procedures (both primary and revision) performed at the Mayo Clinic)	log transformed glucose level 1 day pre surgery in diabetic patients	Age, Gender, BMI, Type of Surgery, ASA, Operative Time ,Diabetes	logistic regression odds ratio(CI)	0.09 (0.02, 0.36)	NS
Maradit,Kremers H., 2015	Low Quality	Infection (PJI)	1 Days	20171	Modifiable risk factor optimization (THA and TKA procedures (both primary and revision) performed at the Mayo Clinic)	log transformed glucose level 1 week pre surgery	Age, Gender, BMI, Type of Surgery, ASA, Operative Time ,Diabetes	logistic regression odds ratio(CI)	0.43 (0.09, 2.03)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Maradit,Kremers H., 2015	Low Quality	Infection (PJI)	1 Days	20171	Modifiable risk factor optimization (THA and TKA procedures (both primary and revision) performed at the Mayo Clinic)	Oral hypoglycemic medication use vs no oral hyperglycemic medication use	Age, Gender, BMI, Type of Surgery, ASA, Operative Time ,Diabetes	logistic regression odds ratio(CI)	1.31 (0.79, 2.17)	NS
Maradit,Kremers H., 2015	Low Quality	Infection (PJI)	1 Days	18764	Modifiable risk factor optimization (THA and TKA procedures (both primary and revision) performed at the Mayo Clinic)	log transformed glucose level 1 day pre surgery in non-diabetic patients	Age, Gender, BMI, Type of Surgery, ASA, Operative Time ,Diabetes	logistic regression odds ratio(CI)	1.86 (0.21, 16.37)	NS
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Modifiable risk factor optimization (THA or TKA athroplasty)	Diabetes	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	1.32 (1.25-1.40) p= <.001	Diabetes increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Modifiable risk factor optimization (patients undergoing THA or TKA)	diabetes in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	5.47 (1.77-16.97) p= .003	Patients more easily developed PJI if they had a history of diabetes
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Modifiable risk factor optimization (patients undergoing THA or TKA)	diabetes treated with insulin in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	3.69 (.63-21.69) p= .148	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Gou,W., 2014	Low Quality	Infection (pji)	4 Days	739	Modifiable risk factor optimization (primary THA or TKA)	diabetes vs no diabetes	gender, age, diabetes, hypertension, steroids, asymptomatic bacteriuria measured by Asymptomatic Leucocyturia	logistic regression odds ratio(CI)	69.65(11.855–409.233)	diabetes increased odds of pji
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Modifiable risk factor optimization (Primary THA)	Diabetes	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	1.11 (.53-2.30) p= .7873	NS
Namba,R.S., 2013	Low Quality	Infection (deep)	Post-Op	56216	Modifiable risk factor optimization (primary elective total knee arthroplasties registered in the total joint replacement registry)	diabetes vs no diabetes	age, sex, race, diabetes, bmi, ASA score, diagnosis, hospital and surgeon characteristics, bilateral surgery, anesthesia type, surgical exposure, antibiotic prophylaxis type	hazard ratio(CI)	1.28(1.03, 1.60)	diabetes increases deep infecton risk
Hinarejos,P., 2013	Low Quality	Infection (deep)	Post-Op	2948	Modifiable risk factor optimization (TKA patients)	diabetes vs no diabetes	none	%infected with diabetes;%infected without diabetes (chi square p value)	25%;16.9%(p=.06)	NS
Adams,A.L., 2013	Low Quality	Infection (PJI)	Post-Op	37966	Modifiable risk factor optimization (TKA)	Diabetes, HbA1c less than 7% compared to no diabetes	sex, age at time of primary surgery, body mass index, and the Deyo adaptation of the Charlson Comorbidity Index	Multiple logistic regression; Odds ration, 95% CI	1.31(0.92, 1.86)	NS
Song,K.H., 2012	Low Quality	Infection (deep incisional and/or organ space infection)	Post-Op	3426	Modifiable risk factor optimization (TKA)	diabetes vs no diabetes	none	p value from chi square	p>.05	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Song,K.H., 2012	Low Quality	Infection (deep incisional and/or organ space infection)	Post-Op	3422	Modifiable risk factor optimization (THA)	Diabetes vs no diabetes	number of surgeries by surgeon, length of hospital stay, diabetes, extrinsic procedure factors, general anesthesia, revision surgery, duration of surgery, trauma infections at other anatomical sites	logistic regression odds ratio(CI)	2.35 (1.32-4.19)	Diabetes increased risk of infection
Namba,R.S., 2012	Low Quality	Infection (deep)	1 Days	30491	Modifiable risk factor optimization (primary elective THRs)	diabetes vs. no diabetes	ASA grade, bilateral surgery, sex, age, diabetes, BMI	Hazard ratio(CI)	1.25(0.85 to 1.83)	NS
Jamsen,E., 2012	Low Quality	Infection (PJI)	Post-Op	6393	Modifiable risk factor optimization (primary hip and knee arthroplasty for osteoarthritis)	diabetes diagnosis vs never diagnosed with diabetes(excludes those who were diagnosed with diabetes after surgery, who may have been undiagnosed before)	BMI, diabetes, preop glucose level(mmol/L), time between eligibility for diabetes medication reimbursement and surgery, diabetes medication type, use of insulin, use of any combination therapy.	logistic regression odds ratio(CI)	2.31 (1.12-4.72)	odds of PJI were greater in diabetics
Jamsen,E., 2012	Low Quality	Infection (PJI)	Post-Op	4419	Modifiable risk factor optimization (primary hip and knee arthroplasty for osteoarthritis)	Preoperative glucose level 6.1-6.8mmol/L vs. <6.1	BMI, diabetes, preop glucose level(mmol/L), time between eligibility for diabetes medication reimbursement and surgery, diabetes medication type, use of insulin, use of any combination therapy.	logistic regression odds ratio(CI)	0.96 (0.19-4.87)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Modifiable risk factor optimization (Primary THA in the 5% national sample of the Medicare database)	diabetes vs. no diabetes	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.31 (1.12-1.53)	diabetes increased risk of PJI
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Modifiable risk factor optimization (Primary TKA in the 5% national sample of the Medicare database)	diabetes vs. no diabetes	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.19 (1.06–1.34)	diabetes increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Modifiable risk factor optimization (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	diabetes vs no diabetes	none	univariate odds ratio(CI)	1.57 (0.81–3.08)	NS
Pedersen,A.B., 2010	Moderate Quality	Infection (revision for deep infection)	Post-Op	57575	Modifiable risk factor optimization (Primary THA in Danish Hip Arthroplasty Registry)	Diabetes with cardivascular comorbidities vs non-diabetics	age, gender, primary diagnosis, hospital type, fixation technique(cemented, uncemented and hybrid implants),, duration of surgery, year of surgery, use of aspirin, use of NSAIDS, use of cortico steroids, use of bisphosphonates, use of antidepressants, Charlson comorbidity index, income	rate ratio from poisson regression	2.35(1.39 to 3.98)	diabetes with cardiovascular complications increased risk of revision for infection compared to non
Pedersen,A.B., 2010	Moderate Quality	Infection (revision for deep infection)	Post-Op	57575	Modifiable risk factor optimization (Primary THA in Danish Hip Arthroplasty Registry)	type 2 diabetes vs. no diabetes	age, gender, primary diagnosis, hospital type, fixation technique(cemented, uncemented and hybrid implants),, duration of surgery, year of surgery, use of aspirin, use of NSAIDS, use of cortico steroids, use of bisphosphonates, use of antidepressants, Charlson comorbidity index, income	rate ratio from poisson regression	1.49 (1.02 to 2.18)	type 2 diabetes increased the risk of revision due to infection compared to non diabetics.

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Pedersen,A.B., 2010	Moderate Quality	Infection (revision for deep infection)	Post-Op	57575	Modifiable risk factor optimization (Primary THA in Danish Hip Arthroplasty Registry)	type 1 diabetes vs no diabetes	age, gender, primary diagnosis, hospital type, fixation technique(cemented, uncemented and hybrid implants),, duration of surgery, year of surgery, use of aspirin, use of NSAIDS, use of cortico steroids, use of bisphosphonates, use of antidepressants, Charlson comorbidity index, income	rate ratio from poisson regression	1.01(.33 to 3.12)	NS
Jamsen,E., 2010	Low Quality	Infection (PJI)	Post-Op	1565	Modifiable risk factor optimization (total knee replacements performed due to osteoarthritis)	plasma glucose 6.1 to 6.9 vs. less than 6.1 mmol/l	age,gender	Hazard ratio(CI)	1.87(0.42–8.41)	NS
Garcia-Alvarez,F., 2010	Low Quality	Infection (deep)	Post-Op	290	Modifiable risk factor optimization (subcapital hip fracture type Garden IV operated by means of partial cemented Thompson hip arthroplasty)	diabetes vs. no diabetes	unclear what confounders included in multivariate model.	p value from logistic regression	p>.05	NS
Namba,R.S., 2009	Low Quality	Infection (deep)	Post-Op	22889	Modifiable risk factor optimization (cemented primary TKA)	no diabetes vs diabetes	age, sex, primary diagnosis (osteoarthritis vs other), ASA score, diabetes, operative time, use of antibiotic cement	logistic regression odds ratio(CI)	0.9 (0.6-1.4)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Dowsey,M.M., 2009	Low Quality	Infection (PJI)	1 Days	1214	Modifiable risk factor optimization (elective TKA)	diabetes vs. no diabetes	cardiovascular disease, diabetes, respiratory disease, smoking, obesity, Rheumatoid arhtritis, transfusion, drain tube, antibiotic cement, gender, age	logistic regression odds ratio(CI)	6.87 2.42–19.56	diabetes increased the risk of pji
Soriano,A., 2008	Low Quality	Infection (deep tissue)	1 Days	908	Modifiable risk factor optimization (Primary TKA)	proportion with diabetes in infected vs uninfected patients	none	proportion infected/proportion uninfected (p value from chi square test)	21.4%/16.3 (p=.44)	NS
Dowsey,M.M., 2008	Low Quality	Infection (PJI)	1 Days	1207	Modifiable risk factor optimization (Primary elective THA)	diabetes vs. no diabetes	none	odds ratio(exact confidence intervals)	2.426(0.688,7.002)	NS
Mazoch,M., 2016	Low Quality	Wound healing complication (Delayed wound healing)	Post-Op	130	Modifiable risk factor optimization (revision total hip and knee surgery)	diabetes vs no diabetes	age, surgeon, and date of surgery. When possible, sex and race were matched as well	relative risk(CI)	1.67 (0.42-6.69)	NS
Chan,P.K.H., 2005	Low Quality	Infection (deep)	3 Days	1165	Modifiable risk factor optimization (primary cemented unilateral total hip arthroplasty)	diabetes vs. no diabetes	age, sex, BMI, diagnosis and coronary history	p value from logistic regression	p>.05	NS
Honkanen,M., 2017	Low Quality	Infection (PJI)	1 Days	20226	Modifiable risk factor optimization (primary Hip or Knee replacement)	diabetes vs. no diabetes	peroperative bacteriuria, Gender, joint site, age, chronic heart disease, chronic lung disease, hypertension, malignancy, neurologic or psychologic disorder, rheumatoid diseaes	logistic regression odds ratio(CI)	1.64(0.99,2.73)	NS

Table 19: Uncontrolled diabetes

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Watts,C.D., 2016	Low Quality	Infection (PJI)	Post-Op	1448	Modifiable risk factor optimization (TKA)	Insulin Dependent	age, BMI, sex	Hazard ratio (95% CI) p-value	2.1 (1.1- 3.7) p= .03	insulin dependent diabetes increased risk of PJI
Chrastil,J., 2015	Low Quality	Infection (PJI)	Post-Op	13372	Modifiable risk factor optimization (diabetic primary THA or TKAs in the Department of Veteran Affairs Informatics and Computing Infrastructure (VINCI))	diabetic complications any vs none	preop HbA1c, preop glucose, age, bmi, gender, charlson index, joint location, diabetic complications, smoking status. death outcome was incorporated as a competing risk	hazard ratio(CI)	1.113(0.879, 1.409)	NS
Chrastil,J., 2015	Low Quality	Infection (PJI)	Post-Op	13372	Modifiable risk factor optimization (diabetic primary THA or TKAs in the Department of Veteran Affairs Informatics and Computing Infrastructure (VINCI))	preop glucose of 194 or higher vs less than 194	preop HbA1c, preop glucose, age, bmi, gender, charlson index, joint location, diabetic complications, smoking status. death outcome was incorporated as a competing risk	hazard ratio(CI)	1.443(1.099,1.894)	higher glucose level was associated with increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Chrastil,J., 2015	Low Quality	Infection (PJI)	Post-Op	13372	Modifiable risk factor optimization (diabetic primary THA or TKAs in the Department of Veteran Affairs Informatics and Computing Infrastructure (VINCI))	preop HbA1c 7 or more vs under 7	preop HbA1c, preop glucose, age, bmi, gender, charlson index, joint location, diabetic complications, smoking status. death outcome was incorporated as a competing risk	hazard ratio(CI)	0.860(0.677,1.100)	NS
Maradit,Kremers H., 2015	Low Quality	Infection (PJI)	1 Days	20171	Modifiable risk factor optimization (THA and TKA procedures (both primary and revision) performed at the Mayo Clinic)	Hemoglobin A1C over 7% vs 7 or less	Age, Gender, BMI, Type of Surgery, ASA, Operative Time ,Diabetes	logistic regression odds ratio(CI)	0.29 (0.04, 2.18)	NS
Adams,A.L., 2013	Low Quality	Infection (PJI)	Post-Op	35449	Modifiable risk factor optimization (TKA)	Diabetes, HbA1c of 7% or more compared to no diabetes	sex, age at time of primary surgery, body mass index, and the Deyo adaptation of the Charlson Comorbidity Index	Multiple logistic regression; Odds ration, 95% CI	0.55(0.29, 1.06)	NS
Jamsen,E., 2012	Low Quality	Infection (PJI)	Post-Op	4416	Modifiable risk factor optimization (primary hip and knee arthroplasty for osteoarthritis)	Preoperative glucose level 6.9mmol/L or higher vs. <6.1	BMI, diabetes, preop glucose level(mmol/L), time between eligibility for diabetes medication reimbursement and surgery, diabetes medication type, use of insulin, use of any combination therapy.	logistic regression odds ratio(CI)	2.25 (0.60-8.50)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Pedersen,A.B., 2010	Moderate Quality	Infection (revision for deep infection)	Post-Op	57575	Modifiable risk factor optimization (Primary THA in Danish Hip Arthroplasty Registry)	diabetes with complications vs. no diabetes	age, gender, primary diagnosis, hospital type, fixation technique(cemented, uncemented and hybrid implants),, duration of surgery, year of surgery, use of aspirin, use of NSAIDS, use of cortico steroids, use of bisphosphonates, use of antidepressants, Charlson comorbidity index, income	rate ratio from poisson regression	2.11(1.41 to 3.17)	diabetes with complications increased risk of revision due to infection vs. non-diabetics
Jamsen,E., 2010	Low Quality	Infection (PJI)	Post-Op	1565	Modifiable risk factor optimization (total knee replacements performed due to osteoarthritis)	plasma glucose of 7 or more vs. less than 6.1 mmol/l	age,gender	Hazard ratio(CI)	4.41(1.31–14.83)	higher plasma glucose increased risk of PJI
Jamsen,E., 2010	Low Quality	Infection (PJI)	Post-Op	1565	Modifiable risk factor optimization (total knee replacements performed due to osteoarthritis)	Glycosylated hemoglobin continuous	age,gender	Hazard ratio(CI) per 1 unit increase	1.60(1.09–2.37)	higher Glycosylated hemoglobin increased risk of pji.
Chiu,F.Y., 2001	Low Quality	Infection (deep)	Post-Op	78	Modifiable risk factor optimization (TKA with patellar and tibial components cemented with 2 g of cefuroxime in 40 g of Simplex P cement)	preop fasting blood surgar level in those with vs without deep infection	none	average level in those without infection; average level in those with infection (t test p value)	129;120 (p=0.493)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Chiu,F.Y., 2001	Low Quality	Infection (deep)	Post-Op	78	Modifiable risk factor optimization (TKA with patellar and tibial components cemented with 2 g of cefuroxime in 40 g of Simplex P cement)	2 hours post meal blood sugar level in those with vs without deep infection	none	average level in those without infection; average level in those with infection (t test p value)	168;162 (p=.695)	NS
Shohat,N., 2017	Low Quality	Infection (PJI)	Post-Op	829	Modifiable risk factor optimization (elective primary THA or TKA)	fructosamine of 292mmol/L or higher vs less than 292mmol/L	used stepwise model, but unclear which variables ended up in the final model	logistic regression odds ratio(CI)	6.2 (1.6 to 24.0)	poorly controlled diabetes resulted in increased odds of PJI
Tarabichi,M., 2017	Low Quality	Infection (PJI)	1 Days	1645	Modifiable risk factor optimization (Diabetic patients with TKA and THA undergoing elective surgery for OA)	HbA1c continuous	age, gender	Adjusted odds ratio (CI) p-value	1.5 (1.2- 2.0) p= .0001	higher HbA1c was associated with higher odds of PJI
Tarabichi,M., 2017	Low Quality	Infection (Wound Complications)	3 months	1645	Modifiable risk factor optimization (Diabetic patients with TKA and THA undergoing elective surgery for OA)	HbA1c continuous	age, gender	adjusted odds ratio (CI) p-value	1.2 (0.9- 1.6) p- .1	NS

Table 20: Obesity:bariatric surgery

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Watts,C., 2016	Low Quality	Infection (PJI)	5 Days	294	Modifiable risk factor optimization (primary THA)	bariatric surgery vs no bariatric surgery	matched by gender, age to within four years, and date of THA to within three years, by pre-bariatric BMI to within 1 kg/m2	Hazard ratio(CI)	3.1(0.8 to 20.3)	NS
Nickel,B.T., 2016	Low Quality	Infection (PJI)	3 months	33096	Modifiable risk factor optimization (TKA for osteoarthritis using perl driver database)	bariatric surgery before TKA vs those with a BMI under 25 at the time of tka	none	odds ratio(p value)	3.12(P< .001)	bariatric surgery increased the risk of PJI vs non-obese patients
Nickel,B.T., 2016	Low Quality	Infection (PJI)	3 months	32534	Modifiable risk factor optimization (TKA for osteoarthritis using perl driver database)	bariatric surgery before TKA vs those with a BMI over 40 at the time of tka	none	odds ratio(p value)	1.02 (P= .893)	NS
Nickel,B.T., 2016	Low Quality	Infection (PJI)	2 Days	32534	Modifiable risk factor optimization (TKA for osteoarthritis using perl driver database)	bariatric surgery before TKA vs those with a BMI over 40 at the time of tka	none	odds ratio(p value)	1.21(P=.002)	bariatric surgery increased the risk of PJI
Nickel,B.T., 2016	Low Quality	Infection (PJI)	2 Days	33096	Modifiable risk factor optimization (TKA for osteoarthritis using perl driver database)	bariatric surgery before TKA vs those with a BMI under 25 at the time of tka	none	odds ratio(p value)	3.05(P < .001)	bariatric surgery increased the risk of PJI vs non-obese patients

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Martin,J.R., 2015	Low Quality	Infection (PJI)	Post-Op	182	Modifiable risk factor optimization (primary TKAs)	Bariatric surgery patients vs high BMI patients with similar BMI to bariatric surgery patients weight before their operation	matched by gender, age,BMI before bariatric surgery, date of TKA	hazard ratio(CI)	1.98 (0.4 to 14.3)	NS
Martin,J.R., 2015	Low Quality	Infection (PJI)	Post-Op	273	Modifiable risk factor optimization (primary TKAs)	Bariatric surgery patients vs low BMI patients with similar BMI to bariatric surgery patients weight after their operation	matched by gender, age,BMI after bariatric surgery, date of TKA	hazard ratio(CI)	2.6 (0.8 to 13.4)	NS

Table 21: Drug use

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Grammatico-Guillon,L., 2015	Low Quality	Infection (PJI)	4 Days	32582	Modifiable risk factor optimization (PJI Hip or Knee arthroplasty)	Drug abuse	Age, sex, year of replacement, diabetes, ulcer sore, cardiologic device, chronic renal failure, urinary tract disorders, cancer, chronice liver diseases, alcohol abuse, tobacco, hypertension, drug abuse, obesity	Hazards models, hazard ration (95% CI), p-value	3.43 (.84, 13.94) p=.08	NS
Best,M.J., 2015	Low Quality	Infection (PJI)	Post-Op	8379490	Modifiable risk factor optimization (primary THA or TKA patients in National Hospital Discharge Survey)	Drug misusers (cannabis, opioids, cocaine, amphetamines, sedatives, inhalants or mixed combinations) vs non-drug misusers	None	Risk Ratio (CI)	16.03 (14.00, 18.36)	Drug users at higher risk of pji
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Modifiable risk factor optimization (Primary THA)	Substance abuse	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	.57 (.21-1.5) p= .2706	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Modifiable risk factor optimization (Primary THA in the 5% national sample of the Medicare database)	drug abuse vs. no drug abuse	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	0.98 (0.36-2.69)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Modifiable risk factor optimization (Primary TKA in the 5% national sample of the Medicare database)	drug abuse vs. no drug abuse	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.14 (0.49–2.66)	NS

Table 22: Recent infection: Urinary Tract Infection or Asymptomatic Bacteriuria

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Singh,H., 2015	Low Quality	Wound healing complication (delayed wound healing)	Post-Op	128	Modifiable risk factor optimization (primary TKA)	patients who have asymptomatic UTI(with positive urine culture) vs. no asymptomatic UTI	none	% risk difference with newcombe score confidence intervals	-1.22(-6.589,6.553)	NS
Sousa,R., 2014	Low Quality	Infection (PJI)	Post-Op	2497	Modifiable risk factor optimization (THA and TKA patients.)	Asymptomatic Bacteriuria vs. no Asymptomatic Bacteriuria	joint location, ASA of 3 or more, Asymptomatic Bacteriuria, Post-Operative UTI	logistic regression odds ratio(CI)	3.95 (1.52–10.26)	Asymptomatic Bacteriuria increased the odds of PJI
Sousa,R., 2014	Low Quality	Infection (PJI)	Post-Op	303	Modifiable risk factor optimization (THA and TKA patients with Asymptomatic Bacteriuria)	Treated Asymptomatic Bacteriuria vs. untreated Asymptomatic Bacteriuria	none	odds ratio(CI)	0.82 (0.27, 2.51)	NS
Gou,W., 2014	Low Quality	Infection (pji)	4 Days	739	Modifiable risk factor optimization (primary THA or TKA)	asymptomatic UTI (measured as asymptomatic leukocyturia) vs no UTI	gender, age, diabetes, hypertension, steroids, asymptomatic bacteriuria measured by Asymptomatic Leucocyturia	logistic regression odds ratio(CI)	1.04(0.138–7.833)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Modifiable risk factor optimization (Primary THA in the 5% national sample of the Medicare database)	Urinary Tract Infection vs. no Urinary Tract Iinfection	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.04 (0.89-1.23)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Modifiable risk factor optimization (Primary TKA in the 5% national sample of the Medicare database)	Urinary Tract Infection vs. no Urinary Tract Iinfection	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.09 (0.97–1.21)	NS
Honkanen,M., 2017	Low Quality	Infection (PJI)	1 Days	20226	Modifiable risk factor optimization (primary Hip or Knee replacement)	preoperative bacteriuria (positive urine culture) vs no bacteriuria	peroperative bacteriuria, Gender, joint site, age, chronic heart disease, chronic lung disease, hypertension, malignancy, neurologic or psychologic disorder, rheumatoid diseaes	logistic regression odds ratio(CI)	0.82(0.38,1.77)	NS

Table 23: Active infection

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Song,K.H., 2012	Low Quality	Infection (deep incisional and/or organ space infection)	Post-Op	3422	Modifiable risk factor optimization (THA)	infections at other anatomical sites vs no infection at other anatomical sites	number of surgeries by surgeon, length of hospital stay, diabetes, extrinsic procedure factors, general anesthesia, revision surgery, duration of surgery, trauma infections at other anatomical sites	logistic regression p value	p>.05	NS
Song,K.H., 2012	Low Quality	Infection (deep incisional and/or organ space infection)	Post-Op	6848	Modifiable risk factor optimization (THA or TKA)	infections at other anatomical sites vs no infection at other anatomical sites	number of surgeon surgeries per mont, ventilation, sex, hospital stay, anesthesia, revision surgery, duration of surgery, infections at other anatomical sites	p value from logistic regression	2.03 (1.09-3.77)	infections at other anatomical sites increased odds of deep infection
Song,K.H., 2012	Low Quality	Infection (deep incisional and/or organ space infection)	Post-Op	3426	Modifiable risk factor optimization (TKA)	infections at other anatomical sites vs no infection at other anatomical sites	number of surgeon surgeries per mont, ventilation, sex, hospital stay, anesthesia, revision surgery, duration of surgery, infections at other anatomical sites	p value from logistic regression	p>.05	NS

Table 24: Active thromboprophylaxis/anticoagulation state

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2014	Low Quality	Infection (PJI)	Post-Op	587	Non-Modifiable risk factors (Primary THA)	Coagulopathy	age, gender, race	multvariate cox regression; adjusted hazard ratio (95% CI); p-value	1.58 (.50-4.97) p= .4371	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	"coagulopathy vs. no coagulopathy "	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.58 (1.24-2.01)	coagulopathy increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	coagulopathy vs. no coagulopathy	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.16 (0.96–1.41)	NS

Table 25: Immunocompromised HIV

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Issa,K., 2017	Low Quality	Infection (pji)	Post-Op	180	Non-Modifiable risk factors (Primary TKA)	HIV contracted through sexual contact or nonblood-transfusion methods(note: all hiv patients medically optimized before surgery) vs no HIV	Matching criteria included patient age (within 2 years), BMI at the time of surgery (within 2 kg/m2), surgeon performing the TKA, followup (within 6 months), minimum followup of 4 years, sex ratio (men to men and women to women), primary diagnosis (DJD versus ON), and operating surgeon	% risk difference with newcombe score confidence intervals	0(-2.767,7.865)	NS
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Non-Modifiable risk factors (THA or TKA athroplasty)	HIV/AIDS	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	1.74 (.96-1.09) p= .068	NS
Lin,C.A., 2013	Low Quality	Infection (PJI)	Post-Op	3849097	Non-Modifiable risk factors (elective TKA)	HIV vs No HIV	none	p value from chi square	p=.68	NS
Lin,C.A., 2013	Low Quality	Wound healing complication (wound complication)	Post-Op	3849097	Non-Modifiable risk factors (elective TKA)	HIV vs No HIV	none	p value from chi square	p=.65	NS
Lin,C.A., 2013	Low Quality	Wound healing complication (wound complication)	Post-Op	376232	Non-Modifiable risk factors (elective THA)	HIV vs No HIV	none	p value from chi square	p=.65	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lin,C.A., 2013	Low Quality	Infection (need for irrigation and debridement)	Post-Op	3849097	Non-Modifiable risk factors (elective TKA)	HIV vs No HIV	none	p value from chi square	p=0.65	NS
Lin,C.A., 2013	Low Quality	Infection (need for irrigation and debridement)	Post-Op	376232	Non-Modifiable risk factors (elective THA)	HIV vs No HIV	none	p value from chi square	p=.01	HIV increased risk of need for irrigation and dibridement
Lin,C.A., 2013	Low Quality	Infection (PJI)	Post-Op	376232	Non-Modifiable risk factors (elective THA)	HIV vs No HIV	none	p value from chi square	p=.45	NS
Silva,M., 2005	Low Quality	Infection (deep infection)	Post-Op	41	Non-Modifiable risk factors (TKA in hemophilia patients with HIV)	cd4 level continuous	none	difference in cd4 levels in those who developed infection vs those who didn't (CI)(cells/mm^3)	-16(0-505)	NS
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	198	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent TKA)	hiv+hep b or hep c	age, gender, comorbidity	odds ratio (95% CI) p-value	2.32 (1.27-4.25) p-.0063	HIV plus hepatitis increased odds of
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	198	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent TKA)	hiv+hep b or hep c	age, gender, comorbidity	odds ratio (95% CI) p-value	2.17 (1.48-3.18) p-.0001	HIV plus hepatitis increased odds of
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	481	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent THA)	HIV vs No HIV	age, gender, comorbidity	odds ratio (95% CI) p-value	.94 (.39-2.27) p-.891	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	481	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent THA)	HIV vs No HIV	age, gender, comorbidity	odds ratio (95% CI) p-value	1.54 (.97-2.44) p-.0673	NS
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	198	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent THA)	hiv+hep b or hep c	age, gender, comorbidity	odds ratio (95% CI) p-value	1.80 (.74-4.40) p-.1987	NS
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	198	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent THA)	hiv+hep b or hep c	age, gender, comorbidity	odds ratio (95% CI) p-value	2.67 (1.59-4.47) p-.0002	HIV plus hepatitis increased odds of
Kildow,B.J., 2017	Low Quality	Infection (PJI)	3 months	481	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent TKA)	HIV vs No HIV	age, gender, comorbidity	odds ratio (95% CI) p-value	1.56 (.93-2.60) p= .0885	NS
Kildow,B.J., 2017	Low Quality	Infection (PJI)	2 Days	481	Non-Modifiable risk factors (HIV, HCV, HBV, and HIV and HBV or HCV who underwent TKA)	HIV vs No HIV	age, gender, comorbidity	odds ratio (95% CI) p-value	2.51 (.1.95-3.23) p- 0	HIV increased odds of joint infection

Table 26: Age

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
George,M.D., 2017	Moderate Quality	Infection (pji)	1 Days	4288	Non-Modifiable risk factors (elective primary or revision hip or knee arthroplasty. patients had rheumatoid arthritis (RA), inflammatory bowel disease (IBD), psoriasis (PsO), psoriatic arthritis (PsA), or ankylosing spondylitis (AS), and all had had received at least one infliximab infusion within 6 months before surgery)	age 80 or older vs. younger	age, sex, glucocorticoid dose, infliximab stopping time, non-biologic DMARD use, previous non-infliximab DMARD use, age, disease type, surgery type, charlson score, number of past year hospitalizations, outpatients per year, calender year, surgeon volume	hazard ratio(CI)	1.27 (0.69, 2.34)	NS
Amlie,E., 2016	Low Quality	Infection (Revision due to PJI)	Post-Op	4406	Non-Modifiable risk factors (revision surgery THA)	Age above 70 years	age and sex	multiple regression model; odds ratio(95% CI), p value	1.710 (.761-3.838) p= .194	NS
Watts,C.D., 2016	Low Quality	Infection (PJI)	Post-Op	1978	Non-Modifiable risk factors (TKA)	Age <= 65 year	age, BMI, sex	Hazard ratio (95% CI) p-value	.9 (.5-1.4) p= .55	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Sousa,R.J., 2016	Low Quality	Infection (PJI)	1 Days	228	Non-Modifiable risk factors (elective primary THA or TKA)	continuous	none	Mean age (range) in those with PJI/Mean age (range) in those without PJI (p value from Mann-Whitney U test)	66.4 (21-92)/70.0 (56-85)(p=.223)	NS
Lee,Q.J., 2015	Low Quality	Infection (PJI in diabetic patient population)	Post-Op	200	Non-Modifiable risk factors (Primary TKA)	age	age, gender, BMI, comorbidity (diabetes, liver disease, heart disease, anemia, thyroid disease, renal disease, lung disease, stroke, gout), varicose vein, steroid intake, dermatitis, acupuncture, bilateral TKA, same day surgery, anesthesia (spinal), continuous femoral nerve block, operating time, trainee surgeon, drain, intensive care unit admission, transfusion, large effusion, blister, soaked dressing, deep vein thrombosis, acute retention of urine, foley catheter, invasive procedure	multivariable logistic regression model; p value	0.018	older age was associated with lower infection risk
Chrastil,J., 2015	Low Quality	Infection (PJI)	Post-Op	13372	Non-Modifiable risk factors (diabetic primary THA or TKAs in the Department of Veteran Affairs Informatics and Computing Infrastructure (VINCI))	continuous per 1 year increase	preop HbA1c, preop glucose, age, bmi, gender, charlson index, joint location, diabetic complications, smoking status. death outcome was incorporated as a competing risk	hazard ratio(CI)	.981(.966-.996)	increased age decreased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wang,H., 2015	Low Quality	Infection (deep)	1.7 weeks	2293	Non-Modifiable risk factors (primary TKA)	continuous	height, weight, diagnosis(OA vs other), uni vs bilateral, operative time, antibiotic bone cement	logistic regression odds ratio	0.992 (0.913-1.078)	NS
Schrama,J.C., 2015	Low Quality	Infection (revision due to infection)	Post-Op	390671	Non-Modifiable risk factors (primary THAs for OA or RA in Nordic Arthroplasty Register Association (NARA) registry)	continuous	age,sex,diagnosis, year of primary surgery (before or after 2001), fixation type	cox proportional hazard ratio(CI)	1.0 (0.99–1.01)	NS
Cai,J., 2014	Low Quality	Infection (PJI)	3 Days	903	Non-Modifiable risk factors (primary THA or TKA)	continuous, but exact coding was unclear	Aquacel dressing, age, bmi, former smoker, thyroid disease, Liver Disease, History of Systemic steroid treatment.	logistic regression odds ratio(CI)	1.09(1.03-1.14)	Age significantly increases odds of PJI
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Non-Modifiable risk factors (patients undergoing THA or TKA)	65-75 vs 45-65	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	3.36 (1.30- 8.69) p= .013	Patients more easily developed PJI if they are older

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Non-Modifiable risk factors (patients undergoing THA or TKA)	> 75 vs 45-65	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	2.54 (.83-7.79) p= .103	NS
Meehan,J.P., 2014	Low Quality	Infection (revision due to pji)	1 Days	120538	Non-Modifiable risk factors (primary total knee arthroplasty)	age 50-64 vs. 65 or older	sex, race, number of comorbidities, age	logistic regression odds ratio(CI)	1.20(1.01-1.42)	younger age was associated with increased odds of revision for PJI compared to older patients
Meehan,J.P., 2014	Low Quality	Infection (revision due to pji)	1 Days	120538	Non-Modifiable risk factors (primary total knee arthroplasty)	age less than 50 vs. 65 or older	sex, race, number of comorbidities, age	logistic regression odds ratio(CI)	1.81(1.33-2.47)	younger age was associated with increased odds of revision for PJI compared to older patients
Gou,W., 2014	Low Quality	Infection (pji)	4 Days	739	Non-Modifiable risk factors (primary THA or TKA)	age continuous	gender, age, diabetes, hypertension, steroids, asymptomatic bacteriuria measured by Asymptomatic Leucocyturia	logistic regression odds ratio(CI)	1.06(0.987–1.138)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Namba,R.S., 2013	Low Quality	Infection (deep)	Post-Op	56216	Non-Modifiable risk factors (primary elective total knee arthroplasties registered in the total joint replacement registry)	continuous/1 year increase	age, sex, race, diabetes, bmi, ASA score, diagnosis, hospital and surgeon characteristics, bilateral surgery, anesthesia type, surgical exposure, antibiotic prophylaxis type	hazard ratio(CI)	0.99(0.98, 1.00)	NS
Hinarejos,P., 2013	Low Quality	Infection (deep)	Post-Op	2948	Non-Modifiable risk factors (TKA patients)	continuous	none	mean(SD) infection group;mean(sd) no infection group (mann-whitney U p value)	75.14(6.66);75.98(7.36) (p=.3)	NS
Dale,H., 2012	Low Quality	Infection (revision for infection)	Post-Op	113280	Non-Modifiable risk factors (primary THAs in Nordic Arthroplasty Register Association dataset)	age 40-51 vs. under 40	age, sex, diagnosis, prosthesis type, fixation type, cement type, cement with antibiotics	Hazard ratio(CI)	1.1(0.8–1.5)	NS
Dale,H., 2012	Low Quality	Infection (revision for infection)	Post-Op	113280	Non-Modifiable risk factors (primary THAs in Nordic Arthroplasty Register Association dataset)	age 60-69 vs. under 40	age, sex, diagnosis, prosthesis type, fixation type, cement type, cement with antibiotics	Hazard ratio(CI)	1.1(0.8–1.5)	NS
Dale,H., 2012	Low Quality	Infection (revision for infection)	Post-Op	113280	Non-Modifiable risk factors (primary THAs in Nordic Arthroplasty Register Association dataset)	age 70-79 vs. under 40	age, sex, diagnosis, prosthesis type, fixation type, cement type, cement with antibiotics	Hazard ratio(CI)	1.1(0.8–1.5)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Dale,H., 2012	Low Quality	Infection (revision for infection)	Post-Op	113280	Non-Modifiable risk factors (primary THAs in Nordic Arthroplasty Register Association dataset)	age 90 or more vs. under 40	age, sex, diagnosis, prosthesis type, fixation type, cement type, cement with antibiotics	Hazard ratio(CI)	0.7(0.4–1.4)	NS
Dale,H., 2012	Low Quality	Infection (revision for infection)	Post-Op	113280	Non-Modifiable risk factors (primary THAs in Nordic Arthroplasty Register Association dataset)	age 80-89 vs. under 40	age, sex, diagnosis, prosthesis type, fixation type, cement type, cement with antibiotics	Hazard ratio(CI)	0.9(0.7–1.3)	NS
Namba,R.S., 2012	Low Quality	Infection (deep)	1 Days	30491	Non-Modifiable risk factors (primary elective THRs)	continuous per 1 year increase	ASA grade, bilateral surgery, sex, age, diabetes, BMI	Hazard ratio(CI)	1.00(0.98 to 1.01)	NS
Koenig,K., 2012	Low Quality	Infection (deep)	3 months	322	Non-Modifiable risk factors (revision THA or conversion from hemiarthroplasty to THA)	age under 65 vs 65-79 vs 80 or greater	none	chi square p value	p=.729	NS
Dale,H., 2011	Low Quality	Infection (Data from NOIS register)	Post-Op	5540	Non-Modifiable risk factors (Total hip arthroplasty)	60-69	age, sex, ASA score, duration of surgery, emergency vs planned surgery, method of fixation, NNIS index	Cox regression analysis; adjested risk (95% CI); p value	1.2 (0.7-2.1) p= 0.5	NS
Dale,H., 2011	Low Quality	Infection (Data from NOIS register)	Post-Op	5540	Non-Modifiable risk factors (Total hip arthroplasty)	70-79	age, sex, ASA score, duration of surgery, emergency vs planned surgery, method of fixation, NNIS index	Cox regression analysis; adjested risk (95% CI); p value	1.4 (0.8-2.4) p=0.2	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Dale,H., 2011	Low Quality	Infection (Data from NOIS register)	Post-Op	5540	Non-Modifiable risk factors (Total hip arthroplasty)	80-89	age, sex, ASA score, duration of surgery, emergency vs planned surgery, method of fixation, NNIS index	Cox regression analysis; adjested risk (95% CI); p value	1.9 (1.1-3.5) p=0.03	Patients who are older have an increased chance of having infection
Dale,H., 2011	Low Quality	Infection (Data from NOIS register)	Post-Op	5540	Non-Modifiable risk factors (Total hip arthroplasty)	>= 90	age, sex, ASA score, duration of surgery, emergency vs planned surgery, method of fixation, NNIS index	Cox regression analysis; adjested risk (95% CI); p value	3.8 (1.1-13) p=0.04	Patients who are older have an increased chance of having infection
Dale,H., 2011	Low Quality	Infection (Data from NAR register)	Post-Op	31086	Non-Modifiable risk factors (Total hip arthroplasty)	60-69	age, sex, ASA score, duration of surgery, emergency vs planned surgery, method of fixation, NNIS index	Cox regression analysis; adjested risk (95% CI); p value	1.3 (0.8-1.9) p=0.3	NS
Dale,H., 2011	Low Quality	Infection (Data from NAR register)	Post-Op	31086	Non-Modifiable risk factors (Total hip arthroplasty)	70-79	age, sex, ASA score, duration of surgery, emergency vs planned surgery, method of fixation, NNIS index	Cox regression analysis; adjested risk (95% CI); p value	1.7 (1.1-2.6) p=0.02	Patients who are older have an increased chance of having infection
Dale,H., 2011	Low Quality	Infection (Data from NAR register)	Post-Op	31086	Non-Modifiable risk factors (Total hip arthroplasty)	80-89	age, sex, ASA score, duration of surgery, emergency vs planned surgery, method of fixation, NNIS index	Cox regression analysis; adjested risk (95% CI); p value	1.9 (1.1-3.0) p=0.02	Patients who are older have an increased chance of having infection
Dale,H., 2011	Low Quality	Infection (Data from NAR register)	Post-Op	31086	Non-Modifiable risk factors (Total hip arthroplasty)	>= 90	age, sex, ASA score, duration of surgery, emergency vs planned surgery, method of fixation, NNIS index	Cox regression analysis; adjested risk (95% CI); p value	1 9.1-7.4) p= 1.0	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Pedersen,A.B., 2010	Low Quality	Infection (revision for infection)	2 weeks	80756	Non-Modifiable risk factors (Primary THA in Danish Hip Arthroplasty Registry)	age 70-79 vs. under 60	sex, age, charlson index, primary diagnosis, previsous surgery on the same hip, fixation technique, operating theater ventilation, ansethesia typ, ossification prophylaxis with NSAIDs, duration of surgery	hazard ratio(CI)	0.97 (0.75–1.26)	NS
Pedersen,A.B., 2010	Low Quality	Infection (revision for infection)	2 weeks	80756	Non-Modifiable risk factors (Primary THA in Danish Hip Arthroplasty Registry)	age 60-69 vs. under 60	sex, age, charlson index, primary diagnosis, previsous surgery on the same hip, fixation technique, operating theater ventilation, ansethesia typ, ossification prophylaxis with NSAIDs, duration of surgery	hazard ratio(CI)	0.98 (0.77–1.24)	NS
Pedersen,A.B., 2010	Low Quality	Infection (revision for infection)	2 weeks	80756	Non-Modifiable risk factors (Primary THA in Danish Hip Arthroplasty Registry)	age 80 or higher vs. under 60	sex, age, charlson index, primary diagnosis, previsous surgery on the same hip, fixation technique, operating theater ventilation, ansethesia typ, ossification prophylaxis with NSAIDs, duration of surgery	hazard ratio(CI)	0.86 (0.63–1.19)	NS
Mortazavi,S.M., 2010	Low Quality	Infection (deep)	Post-Op	476	Non-Modifiable risk factors (first revision TKA patients. 385 revisions were for infection and 91 were for aseptic causes of failure)	continuous	none	univariate odds ratio(CI)	0.99 (0.97–1.02)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Ohmann,C., 2010	Moderate Quality	Wound healing complication (Postoperative Hematoma or Secondary Bleeding)	Post-Op	229271	Non-Modifiable risk factors (primary TKA patients in German BSQ quality database before hospital volume regulation instituted)	continuous	year of operation, age, sex, ASA score, Modified Kellgren lawrence score	logistic regression odds ratio(CI)	1.009 (1.006 to 1.013)	age increases odds of Postoperative Hematoma or Secondary Bleeding
Ohmann,C., 2010	Moderate Quality	Wound healing complication (Postoperative Hematoma or Secondary Bleeding)	Post-Op	244244	Non-Modifiable risk factors (primary TKA patients in German BSQ quality database after hospital volume regulation instituted)	continuous	year of operation, age, sex, ASA score, Modified Kellgren lawrence score	logistic regression odds ratio(CI)	1.008 (1.004 to 1.011)	age increases odds of Postoperative Hematoma or Secondary Bleeding
Hailer,N.P., 2010	Low Quality	Infection (revision for infection)	Post-Op	170413	Non-Modifiable risk factors (totally cemented or totally uncemented THAs in Swedish HIp Arthroplasty Register)	age 60-75 vs. age under 50	primary diagnosis, age, sex, cemented vs uncemented fixation	Hazard ratio(CI)	0.7 (0.5 –1.1)	NS
Hailer,N.P., 2010	Low Quality	Infection (revision for infection)	Post-Op	170413	Non-Modifiable risk factors (totally cemented or totally uncemented THAs in Swedish HIp Arthroplasty Register)	age over 75 vs. age under 50	primary diagnosis, age, sex, cemented vs uncemented fixation	Hazard ratio(CI)	0.7 (0.5 –1.0)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Hailer,N.P., 2010	Low Quality	Infection (revision for infection)	Post-Op	170413	Non-Modifiable risk factors (totally cemented or totally uncemented THAs in Swedish HIp Arthroplasty Register)	Age 50-59 vs. age under 50	primary diagnosis, age, sex, cemented vs uncemented fixation	Hazard ratio(CI)	0.8 (0.6 –1.2)	NS
Garcia-Alvarez,F., 2010	Low Quality	Infection (deep)	Post-Op	290	Non-Modifiable risk factors (subcapital hip fracture type Garden IV operated by means of partial cemented Thompson hip arthroplasty)	continuous	unclear what confounders included in multivariate model.	p value from logistic regression	p>.05	NS
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Non-Modifiable risk factors (Primary THAs in the Norwegian Arthroplasty Register)	age less than 40 vs 70-79	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI)	0.5(0.3–1.1)	NS
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Non-Modifiable risk factors (Primary THAs in the Norwegian Arthroplasty Register)	age 40-59 vs 70-79	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI)	0.8(0.6–1.1)	NS
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Non-Modifiable risk factors (Primary THAs in the Norwegian Arthroplasty Register)	age 60-69 vs 70-79	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI)	1.1(0.9–1.3)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Non-Modifiable risk factors (Primary THAs in the Norwegian Arthroplasty Register)	age 80 or older vs vs 70-79	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI)	0.9(0.7–1.2)	NS
Gandhi,R., 2009	Low Quality	Infection (deep)	1 Days	1625	Non-Modifiable risk factors (THA with a diagnosis of primary or secondary osteoarthritis or rheumatoid arthritis)	continuous	antibiotic cement, age, sex, bmi, charlson index, education, preop womac score, Rheumatoid arthritis.	logistic regression odds ratio(CI)	1.0 (0.9,1.0)	NS
Namba,R.S., 2009	Low Quality	Infection (deep)	Post-Op	22889	Non-Modifiable risk factors (cemented primary TKA)	age 55 or older vs. age less than 55	age, sex, primary diagnosis (osteoarthritis vs other), ASA score, diabetes, operative time, use of antibiotic cement	logistic regression odds ratio(CI)	.43(.29-.67)	deep infection odds were decreased in patients age 55 or older
Ong,K.L., 2009	Moderate Quality	Infection (PJI)	Post-Op	39929	Non-Modifiable risk factors (primary THA patients from Medicare 5% national sample administrative claims database)	coding unclear	age, sex, charlson index, race, census region, ownership, bed-size, medicare buy-in, teaching status, location, procedure duration	p value from cox proportional hazards mocel.	p=0.464	NS
Ong,K.L., 2009	Moderate Quality	Infection (PJI)	Post-Op	28544	Non-Modifiable risk factors (primary elective THA patients from Medicare 5% national sample administrative claims database)	coding unclear	age, sex, charlson index, race, census region, ownership, bed-size, medicare buy-in, teaching status, location, procedure duration	p value from cox proportional hazards mocel.	p=0.121	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Dowsey,M.M., 2008	Low Quality	Infection (PJI)	1 Days	1207	Non-Modifiable risk factors (Primary elective THA)	continuous	none	median age in infected patients/median age in non-infected patients(p value)	70/69(p=.20)	NS
Muilwijk,J., 2006	Low Quality	Infection (deep)	Post-Op	26127	Non-Modifiable risk factors (primary THA)	age 75 or higher vs. under 45	sex, age, emergency surgery, NNIS risk score, post op stay, specific hospital patient was operated at, mean predicted probability of infection for a hosptital	logistic regression odds ratio(CI)	2.5(0.8–8.0)	NS
Muilwijk,J., 2006	Low Quality	Infection (deep)	Post-Op	26127	Non-Modifiable risk factors (primary THA)	age 45-64 vs. under 45	sex, age, emergency surgery, NNIS risk score, post op stay, specific hospital patient was operated at, mean predicted probability of infection for a hosptital	logistic regression odds ratio(CI)	1.5(0.4–4.9)	NS
Muilwijk,J., 2006	Low Quality	Infection (deep)	Post-Op	26127	Non-Modifiable risk factors (primary THA)	age 65-74 vs. under 45	sex, age, emergency surgery, NNIS risk score, post op stay, specific hospital patient was operated at, mean predicted probability of infection for a hosptital	logistic regression odds ratio(CI)	2.1(0.6–6.7)	NS
Chiu,F.Y., 2001	Low Quality	Infection (deep)	Post-Op	78	Non-Modifiable risk factors (TKA with patellar and tibial components cemented with 2 g of cefuroxime in 40 g of Simplex P cement)	continuout	none	age without infection vs age with infection (p value from t test)	72;70 (p=.735)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Tarabichi,M., 2017	Low Quality	Infection (Wound Complications)	3 months	1645	Non-Modifiable risk factors (Diabetic patients with TKA and THA undergoing elective surgery for OA)	Age and diabetes	age, gender	adjusted odds ratio (CI) p-value	1.0 (0.9- 1.0) p- .05	NS
Honkanen,M., 2017	Low Quality	Infection (PJI)	1 Days	20226	Non-Modifiable risk factors (primary Hip or Knee replacement)	continuous, but unclear how many years increase odds ratio coefficient represents	peroperative bacteriuria, Gender, joint site, age, chronic heart disease, chronic lung disease, hypertension, malignancy, neurologic or psychologic disorder, rheumatoid diseaes	logistic regression odds ratio(CI)	1.03(1.01,1.05)	age increased odds of PJI
Chen,A.F., 2017	Low Quality	Infection (PJI)	Post-Op	32580	Non-Modifiable risk factors (primary or revision TJA.)	age	bmi, comorbidity, length of stay,	Adjusted odds ratio (CI) p-value	.99 (.98-1.0) p- .015	age decreased odds of PJI

Table 27: Dementia

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	40919	Non-Modifiable risk factors (Primary THA in the 5% national sample of the Medicare database)	dementia vs. no dementia	Rheumatologic disease, Obesity, coagulopathy, preoperative anemia, diabetes, cardiac arrhythmia, peripheral vascular disease, depression ,psychosis, congestive heart failure, alcohol abuse, , hypertension, malignancy, metastatic tumor, Hypercholesterolemia, chronic pulmonary disease, renal disease, pulmonary circulation, Hemiplegia or paraplegia, Urinary tract infection, Valvular disease, Cerebrovascular disease, Peptic ulcer disease, Hypothyroidism, Ischemic heart disease, Chronic liver disease, dementia, drug abuse	Hazard ratio(CI)	1.02 (0.65-1.60)	NS
Bozic,K.J., 2012	Low Quality	Infection (PJI)	3 months	83011	Non-Modifiable risk factors (Primary TKA in the 5% national sample of the Medicare database)	dementia vs. no dementia	Congestive heart failure, chronic pulmonary disease, preoperative anemia, depression, renal disease, pulmonary circulation, obesity Rheumatologic disease, psychoses, metastatic tumor, Peripheral vascular disease, Valvular disease, Ischemic heart disease, Cardiac arrhythmia, Coagulopathy, Urinary tract infection, Cerebrovascular disease, Lymphoma, Peptic ulcer disease, Malignancy, Hypercholesterolemia, Hemiplegia/paraplegia, Chronic liver disease, Alcohol abuse, Hypothyroidism, Hypothyroidism, Hypertension, Dementia	Hazard ratio(CI)	1.03 (0.66–1.61)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Garcia-Alvarez,F., 2010	Low Quality	Infection (deep)	Post-Op	290	Non-Modifiable risk factors (subcapital hip fracture type Garden IV operated by means of partial cemented Thompson hip arthroplasty)	dementia vs no dementia	unclear what confounders included in multivariate model.	p value from logistic regression	p>.05	NS
Pulido,L., 2008	Low Quality	Infection (PJI)	5 Days	9245	Non-Modifiable risk factors (primary hip or knee arthroplasty)	dementia vs no dementia	variables considered for stepwise model:race, physical status score (ASA), body mass index, rheumatoid arthritis, venous thromboembolism, anemia, hypercholesterolemia, dementia, knee arthroplasty, simultaneous bilateral surgery, operative time, hospital length, postoperative creatinine, allogenic transfusion, postoperative atrial fibrillation, postoperative myocardial infarction, postoperative urinary tract infection, postoperative wound drainage, postoperative hematoma	stepwise logistic regression p value	p>.05	NS

Table 28: Poor dental health

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wu,C., 2014	Low Quality	Infection (PJI)	Post-Op	297	Modifiable risk factor optimization (patients undergoing THA or TKA)	dental procedures with antibiotic prophylaxis in cases vs controls	diabetes, age, BMI, place of residence, alcohol abuse, treatment of diabetes, chronic pulmonary disease, hypertension, substance abuse, cerebral infarction, dental procedure w/ or w/o antibiotics, renal disease, gout, cardiovascular event, chronic liver disease, anemia, tobacco use, ankylosing spondylitis, THA vs TKA, gender, prostatic disease, oncologic disease, neurologic disease, history of tuberculosis, rheumatoid arthritis vs osteoarthritis, femoral head necrosis, developmental hip dysplasia, fracture	multivariate conditional logistic regression analysis; odds ratio (95% CI), p value	1.71 (.38-7.70) p= .487	NS

Table 29: Institutionalization

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Gallardo-Calero,I., 2016	Low Quality	Infection (PJI)	3 Days	381	Non-Modifiable risk factors (hip hemiarthroplasty patients treated for proximal femur fracture)	patients whose permanent residence was a healthcare center vs non-institutionalized patients	none	odds ratio(CI)	2.47 (1.02–5.99)	institutionalized hemiarthroplasty patients were at increased odds of PJI

Table 30: Autoimmune disease

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Jiang,S.L., 2014	Low Quality	Infection (PJI)	6 Days	880786	Non-Modifiable risk factors (THA or TKA athroplasty)	Autoimmune disease (rheumatoid arthritis, lupus, ankylosing spondylitis)	Age, sex, procedure type, hip fracture, number of medical comorbidities	Multivariate regression, Hazard Ration (95% CI), p-value	1.55 (1.40-1.72) p= <.001	autoimmune disease increased risk of PJI

INTRA-ARTICULAR INJECTIONS SECTION

Quality Evaluation Table 3- Intra-articular Injection Observational Studies

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Amin,N.H., 2016	◑	●	○	●	○	●	Include	Low Quality
Chambers,A.W., 2017	◑	◑	◑	●	◑	●	Include	Moderate Quality
Desai,A., 2009	◑	●	◑	●	○	●	Include	Low Quality
Kaspar,S., 2005	◑	●	◑	●	◑	○	Include	Low Quality
Khanuja,H.S., 2016	◑	●	◑	●	◑	◑	Include	Low Quality
Kokubun,B.A., 2017	◑	●	◑	●	○	◑	Include	Low Quality
McIntosh,A.L., 2006	◑	●	●	●	○	○	Include	Low Quality
Meermans,G., 2012	◑	●	◑	●	◑	◑	Include	Low Quality
Papavasiliou,A.V., 2006	◑	◑	◑	●	○	◑	Include	Low Quality
Sreekumar,R., 2007	◑	◑	◑	●	○	◑	Include	Low Quality
Ravi,B., 2015	◑	●	○	●	◑	◑	Include	Low Quality
Schairer,W.W., 2016	◑	●	◑	●	◑	◑	Include	Low Quality
Bedard,N.A., 2017	◑	●	○	●	○	◑	Include	Low Quality

Figure 31: Summary of Findings-intra-articular injection vs. No intra-articular injection

	Moderate Quality	Low Quality											
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Chambers,A.W., 2017**	**Meermans,G., 2012**	**Sreekumar,R., 2007**	**McIntosh,A.L., 2006**	**Kaspar,S., 2005**	**Amin,N.H., 2016**	**Desai,A., 2009**	**Papavasiliou,A.V., 2006**	**Khanuja,H.S., 2016**	**Kokubun,B.A., 2017**	**Schairer W.W.,2016**	**Ravi,B.,2015**	**Bedard,N.A,2017**
Knee Complications													
Infection(deep)						●	●	●	●	●			
Infection(deep; excluding injection time subgroups with less than 25 patients to meet CPG inclusion criteria)									●				
reoperation for infection													↓
Hip Complications													
Infection(PJI)	↓										↓	↓	
Infection(deep infection)		●		●									
Infection(revision for infection)		●											
Wound healing complication(prolonged drainage)		●											
Infection(deep with follow up of at least 1 year)			●										
Hip Reoperation													
Infection(revision for deep infection(statistical power was low))					●								

Table 31: Intra-articular injection vs. No intra-articular injection

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Chambers,A.W., 2017	Moderate Quality	Infection (PJI)	Post-Op	456	Timing of steroid/visco injections prior to TJA (cementless THA patients with prior intrarticular hip steriod injection)	injections within 90 days of surgery vs over 90 days from surgery	matched by age, gender, ASA score, presence of diabetes, BMI, double vs single injections	p value from fisher's exact test in double injection group; p value in single injection group	p=.6;p=.323	NS
Chambers,A.W., 2017	Moderate Quality	Infection (PJI)	Post-Op	456	Timing of steroid/visco injections prior to TJA (cementless THA patients with prior intrarticular hip steriod injection)	2 prior steroid injections vs 1 injection	matched by age, gender, ASA score, presence of diabetes, BMI	odds ratio(CI)	3.30 (1.13, 9.63)	having 2 injections vs 1 injection increased the risk of pji
Amin,N.H., 2016	Low Quality	Infection (deep)	Post-Op	1143	Timing of steroid/visco injections prior to TJA (TKA)	steroid injections prior to tka	none	Risk Ratio (CI)	.9389(0.2964-2.9740)	NS
Amin,N.H., 2016	Low Quality	Infection (deep)	Post-Op	1143	Timing of steroid/visco injections prior to TJA (TKA)	timing of injections in months: 0-3 vs 3-6 vs 6-9 vs 9-12 vs over 12	none	fisher's exact test p value	p>.05	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Amin,N.H., 2016	Low Quality	Infection (deep)	Post-Op	1206	Timing of steroid/visco injections prior to TJA (TKA)	viscosupplementation injections prior to tka	none	Risk Ratio (CI)	.3995(0.0879-1.8153)	NS
Amin,N.H., 2016	Low Quality	Infection (deep)	Post-Op	1206	Timing of steroid/visco injections prior to TJA (TKA)	timing of injections in months: 0-3 vs 3-6 vs 6-9 vs 9-12 vs over 12	none	fisher's exact test p value	p>.05	NS
Meermans,G., 2012	Low Quality	Infection (deep infection)	Post-Op	350	Timing of steroid/visco injections prior to TJA (primary THA)	Intra-articular steroid within 1 year of arthroplasty vs no steroids.	matched for ASA score, age, BME, sex, implant type, and year of THA	events grp1/N1; events grp 2/N2 (fisher's exact test p value)	1/175; 1/175 (p=1)	NS
Meermans,G., 2012	Low Quality	Infection (revision for infection)	Post-Op	350	Timing of steroid/visco injections prior to TJA (primary THA)	Intra-articular steroid within 1 year of arthroplasty vs no steroids.	matched for ASA score, age, BME, sex, implant type, and year of THA	p value from kaplan meier	p>.05	NS
Meermans,G., 2012	Low Quality	Wound healing complication (prolonged drainage)	Post-Op	350	Timing of steroid/visco injections prior to TJA (primary THA)	Intra-articular steroid within 1 year of arthroplasty vs no steroids.	matched for ASA score, age, BME, sex, implant type, and year of THA	events grp1/N1; events grp 2/N2 (fisher's exact test p value)	7/175; 5/175 (p=.77)	NS
Desai,A., 2009	Low Quality	Infection (deep)	Post-Op	270	Timing of steroid/visco injections prior to TJA (primary TKA)	prior steroid injection vs. no prior steroid injection	age, sex and year of operation	% risk difference with newcombe score confidence intervals	0(-2.09,4.094)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Sreekumar,R., 2007	Low Quality	Infection (deep with follow up of at least 1 year)	Post-Op	202	Timing of steroid/visco injections prior to TJA (THA)	prior Steroid infiltration vs no Steroid infiltration	matched by age, gender and year of operation	% risk difference with newcombe confidence intervals	-0.735(-4.047,4.798)	NS
McIntosh,A.L., 2006	Low Quality	Infection (deep infection)	Post-Op	448	Timing of steroid/visco injections prior to TJA (primary THA)	steroid injections within 1 year of arthroplasty vs no injections within 1 year	matched by gender, age, and surgeon	cox proportional hazard ratio(CI)	3(0.3, 29.8)	NS
Papavasiliou,A.V., 2006	Low Quality	Infection (deep)	Post-Op	144	Timing of steroid/visco injections prior to TJA (TKR patients)	steroids within 12 months prior to surgery vs. no steroids	None	events g1/N1; events g2/N2 (fisher's exact test p value)	3/54;0/90 (p=.051	NS
Kaspar,S., 2005	Low Quality	Infection (revision for deep infection(statistical power was low))	Post-Op	80	Timing of steroid/visco injections prior to TJA (primary THA)	steroid injection vs no steroid injection	matched in descending order of priority, by gender, cemented or cementless THA, age, body mass index (BMI), American Society of Anaesthesia (ASA) pre-operative score, the year of THA, and the surgeon	% in steroid group/percent in control group (p-value from exact test)	10%/0% (p=.116)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Khanuja,H.S., 2016	Low Quality	Infection (deep; mean follow up 3.5 years)	Post-Op	604	Timing of steroid/visco injections prior to TJA (primary TKA for osteoarthritis)	intra-articular corticosteroid injections vs no injections	diagnosis, gender , date of surgery within 3 months, age within 2 years, mean follow-up within 6 months, identical American Society of Anesthesiologists (ASA) status, and BMl within 3 kg/m2	Risk Ratio (CI)	.5(0.12-1.98)	NS
Khanuja,H.S., 2016	Low Quality	Infection (deep; excluding injection time subgroups with less than 25 patients to meet CPG inclusion criteria)	Post-Op	604	Timing of steroid/visco injections prior to TJA (primary TKA for osteoarthritis)	days from steroid injection to surgery: 31-60 vs. 61-120 vs. 121-180 vs 181-365	diagnosis, gender , date of surgery within 3 months, age within 2 years, mean follow-up within 6 months, identical American Society of Anesthesiologists (ASA) status, and BMl within 3 kg/m2	chi square test p-value	p=.8	NS
Kokubun,B.A., 2017	Low Quality	Infection (deep)	1 Days	442	Timing of steroid/visco injections prior to TJA (primary tka)	continuous number of all injections	none	odds ratio(CI)	.962(0.797-1.161)	NS
Kokubun,B.A., 2017	Low Quality	Infection (deep)	1 Days	442	Timing of steroid/visco injections prior to TJA (primary tka)	continuous number of corticosteroid injections	none	odds ratio(CI)	.892(0.654-1.217)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kokubun,B.A., 2017	Low Quality	Infection (deep)	1 Days	442	Timing of steroid/visco injections prior to TJA (primary tka)	continuous number of Viscosupplementation injections	none	odds ratio(CI)	.998(0.832-1.198)	NS
Kokubun,B.A., 2017	Low Quality	Infection (deep)	1 Days	442	Timing of steroid/visco injections prior to TJA (primary tka)	any injection within 90 days vs no injection	none	odds ratio(CI)	.534(0.116-2.446)	NS
Schairer,W.W., 2016	Low Quality	Infection(PJI)	1 year	168537	Timing of steroid/visco injections prior to TJA (primary tha)	Injection 0 to 3 months before THA vs no injection	Injection timing, age, sex, tobacco use, transfusions, obesity, diabetes, peripheral vascular disease, congestive heart failure, HIV/AIDS, Tumor without metastases, metastatic tumor, cardiac arrhythmia, blood loss anemia, deficiency anemia, renal failure, chronic pulmonary disease, pulmonary circulatory disorder, liver disease, depression.	Hazard Ratio(CI)	1.49(1.08-2.04)	Those with injection within three month of surgery were at greater risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Schairer,W.W., 2016	Low Quality	Infection(PJI)	1 year	168537	Timing of steroid/visco injections prior to TJA (primary tha)	Injection 3-6 months before THA vs no injection	Injection timing, age, sex, tobacco use, transfusions, obesity, diabetes, peripheral vascular disease, congestive heart failure, HIV/AIDS, Tumor without metastases, metastatic tumor, cardiac arrhythmia, blood loss anemia, deficiency anemia, renal failure, chronic pulmonary disease, pulmonary circulatory disorder, liver disease, depression.	Hazard Ratio(CI)	0.94(0.62-1.41)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Schairer,W.W., 2016	Low Quality	Infection(PJI)	1 year	168537	Timing of steroid/visco injections prior to TJA (primary tha)	Injection 6 to 12 months before THA vs no injection	Injection timing, age, sex, tobacco use, transfusions, obesity, diabetes, peripheral vascular disease, congestive heart failure, HIV/AIDS, Tumor without metastases, metastatic tumor, cardiac arrhythmia, blood loss anemia, deficiency anemia, renal failure, chronic pulmonary disease, pulmonary circulatory disorder, liver disease, depression.	Hazard Ratio(CI)	1.22(0.82-1.84)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Schairer,W.W., 2016	Low Quality	Infection(PJI)	1 year	168537	Timing of steroid/visco injections prior to TJA (primary tha)	Injection greater than 1 year before THA vs no injection	Injection timing, age, sex, tobacco use, transfusions, obesity, diabetes, peripheral vascular disease, congestive heart failure, HIV/AIDS, Tumor without metastases, metastatic tumor, cardiac arrhythmia, blood loss anemia, deficiency anemia, renal failure, chronic pulmonary disease, pulmonary circulatory disorder, liver disease, depression.	Hazard Ratio(CI)	0.88(0.50-1.56)	NS
Ravi,B.,2015	Low Quality	Infection(PJI)	2 years	37881	Timing of steroid/visco injections prior to TJA (primary tha)	Injection less than 1 year before THA vs no injection	Age, sex, income, comorbidities, frailty, teaching hospital, annual hospital THA volume, annual surgeon volume, injection himing	Hazard Ratio(CI)	1.37 (1.01–1.86)	Injection within 1 year of THA increased risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Ravi,B.,2015	Low Quality	Infection(PJI)	2 years	37881	Timing of steroid/visco injections prior to TJA (primary tha)	Injection 1 to 5 years before THAvs no injection	Age, sex, income, comorbidities, frailty, teaching hospital, annual hospital THA volume, annual surgeon volume, injection himing	Hazard Ratio(CI)	1.26 (0.84–1.89)	NS
Bedard,N.A,2017	Low Quality	Reoperation for infection	6 months	83684	Timing of steroid/visco injections prior to TJA (primary tka)	Any injection on ipsilateral side of tka within 6 months of TKA vs no injection	None	Odds Ratio(CI)	1.4(1.3-1.63)	Having any injection on ipsilateral side within 6 months increased reoperation for infection

PREOPERATIVE DIAGNOSIS SECTION

Quality Evaluation Table 4- Preoperative Diagnosis

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Alijanipour,P., 2013	●	◑	●	●	●	◑	Include	Moderate Quality
Balato,G., 2017	●	●	◑	○	◑	●	Include	Low Quality
Barrack,R.L., 1993	●	●	◑	◑	◑	●	Include	Moderate Quality
Barrack,R.L., 1997	●	●	◑	◑	◑	●	Include	Moderate

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
								Quality
Berger,P., 2017	●	◑	●	●	◑	○	Include	Low Quality
Bernard,L., 2004	●	◑	○	◑	◑	●	Include	Low Quality
Bingham, J,. 2014	●	◑	●	●	○	◑	Include	Low Quality
Bottner,F., 2007	●	◑	●	●	◑	●	Include	Moderate Quality
Buttaro,M.A., 2010	●	◑	●	◑	●	●	Include	Moderate Quality
Choi,H.R., 2016	●	◑	●	○	◑	●	Include	Low Quality
Cipriano,C.A., 2012	●	●	●	●	◑	◑	Include	Moderate Quality
Claassen,L., 2016	●	●	●	●	○	○	Include	Low Quality
Deirmengian,C., 2014	●	◑	◑	●	◑	○	Include	Low Quality
Della Valle,C.J., 2007	●	●	●	●	◑	●	Include	High Quality
Eisler,T., 2001	●	●	●	●	◑	●	Include	High Quality
Elgeidi,A., 2014	●	●	●	○	◑	●	Include	Moderate Quality
Fernandez-Sampedro,M., 2017	●	◑	●	●	◑	●	Include	Moderate Quality
Fink,B., 2008	●	◑	●	●	◑	●	Include	Moderate Quality
Ghanem,E., 2008	●	◑	●	●	◑	●	Include	Moderate Quality
Glithero,P.R., 1993	●	◑	●	◑	◑	●	Include	Moderate Quality
Greidanus,N.V., 2007	●	●	●	●	◑	●	Include	High Quality

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Higuera,C.A., 2017	●	◑	●	●	◑	○	Include	Low Quality
Jacovides,C.L., 2011	●	◑	●	●	◑	○	Include	Low Quality
Kamme,C., 1981	●	●	●	◑	◑	●	Include	Moderate Quality
Koh,I.J., 2017	●	●	●	●	◑	◑	Include	Moderate Quality
Kraemer,W.J., 1993	●	◑	○	◑	◑	●	Include	Low Quality
Kwon,Y.M., 2016	●	●	◑	○	◑	●	Include	Low Quality
Malhotra,R., 2004	●	●	◑	◑	◑	●	Include	Moderate Quality
Melendez,D.P., 2016	●	◑	●	●	◑	●	Include	Moderate Quality
Morgenstern,C., 2017	●	◑	●	●	◑	○	Include	Low Quality
Mulcahy,D.M., 1996	●	●	◑	●	◑	●	Include	Moderate Quality
Omar,M., 2015	●	◑	◑	◑	◑	●	Include	Low Quality
Pons,M., 1999	●	◑	●	◑	◑	●	Include	Moderate Quality
Roberts,P., 1992	●	●	◑	●	◑	◑	Include	Moderate Quality
Ryu,S.Y., 2014	●	○	●	●	◑	○	Include	Low Quality
Savarino,L., 2004	●	●	●	◑	◑	●	Include	Moderate Quality
Schinsky,M.F., 2008	●	●	●	●	◑	◑	Include	Moderate Quality
Shafafy,R., 2015	●	◑	◑	●	◑	●	Include	Moderate Quality

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Spangehl,M.J., 1999	●	●	◑	◑	◑	●	Include	Moderate Quality
Trampuz,A., 2004	●	●	◑	◑	◑	●	Include	Moderate Quality
Vanderstappen,C., 2013	●	◑	◑	●	◑	○	Include	Low Quality
Williams,J.L., 2004	●	●	◑	●	◑	●	Include	Moderate Quality
Yuan,K., 2015	●	●	◑	◑	◑	●	Include	Moderate Quality

Guide to Interpreting Likelihood Ratios

Positive Likelihood Ratio	Negative Likelihood Ratio	Test strength	Interpretation
>10	<0.1	Strong	Large and conclusive change in probability of PJI
5-10	0.1-0.2	Moderate	Moderate change in probability of PJI
2-5	0.2-0.5	Weak	Small (but sometimes important) change in probability of PJI
1-2	0.5-1	Poor	Small (and rarely important) change in probability of PJI

Evidence Summary: Serum ESR

There were two high quality studies, eight moderate and 1 low quality study evaluating serum ESR(Della Valle 2007;Greidanus 2007;Alijanipour 2013;Bottner 2007;Buttaro 2010;Cipriano 2012;Elgeidi 2014;Kamme 1981;Savarino 2004;Schinsky 2008;Kwon 2016). Four studies evaluated both hip and knee patients(Alijanipour 2013;Bottner 2007;Cipriano 2012;Elgeidi 2014); six evaluated hip patients(Alijanipour 2013;Buttaro 2010;Kamme 1981;Savarino 2004;Schinsky 2008;Kwon 2016) and three studies evaluated knee patients(Della Valle 2007;Greidanus 2007;Alijanipour 2013).

Test positivity thresholds ranged from 15mm/hr to 54mm/hr. The most commonly used threshold was 30mm/hr. A meta-analysis was done using this threshold. However, there was very high statistical heterogeneity in the positive likelihood ratio(LR), so only the range is reported. The positive LR in the included studies ranged from 1.58 (a poor rule in test) to 6.7 (a moderately strong rule in test). The meta-analysis revealed a heterogeneity I-squared statistic under 50% for the negative LR, and therefore the pooled estimate is reported in table 5. The pooled negative likelihood ratio for ESR of 30mm/hr was 0.12(0.08,0.20), indicating a moderately strong rule out test.

Regarding other thresholds above 30, most produced positive likelihood ratios in the weak to moderate range, from 2.64 to <10 (see table 1). The one exception was the highest threshold of 54.5mm/hr, which was a strong rule in tests (positive LR=11.36), but was a weaker rule out test than 30mm/hr (negative LR=.22)(Alijanipour 2013). For other thresholds above 30, most studies produced negative likelihood ratios that ranged from moderately strong to weak (negative LR range=.15 to <.5).

One high quality knee study (Greidanus 2007) and one moderate quality hip study (Savarino 2004) evaluated ESR <30mm/hr. The knee study used a threshold of 22.5mm/hr and found it was a moderately strong rule in test and a strong rule out test(positive LR=5.5, negative LR=.08). The hip study used a threshold of 15mm/hr, which was the lowest cut point of all the studies. The article evaluated the test using different reference standards and it was shown to be a poor rule in test (positive LR range=0.94-1.07), and a poor rule out test(negative LR range=0.91-1.09).

One moderate quality hip and knee study (Cipriano 2012) and one low quality hip study (Kwon 2016) evaluated ESR in patient populations that may make the test less accurate. Cipriano evaluated an ESR of 30mm/hr in hip and knee patients with inflammatory arthritis. In these patients, ESR was a weak rule in test(positive LR=2.34) and a strong rule out test(negative LR=.09). Kwon et al. evaluated ESR in hip patients with dual taper modular implants with taper corrosion, using a threshold of 22mm/hr. In these patients, the test was a strong rule-in test (positive LR=10.48), but a weak rule out test(negative LR=.45).

Table 32: Summary of Findings- serum ESR

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	serum ESR in patients with dual taper modular implants with taper corrosion(22mm/h)	1L	10.48-10.48	0.45-0.45	0.57-0.57	0.95-0.95
	serum ESR in patients with inflammatory arthritis(30mm/hr)	1M	2.34-2.34	0.09-0.09	0.95-0.95	0.6-0.6
	serum ESR(15mm/hr)	1M	0.94-1.07	0.91-1.09	0.56-0.6	0.4-0.44
	serum ESR(22.5mm/hr)	1H	5.5-5.5	0.08-0.08	0.93-0.93	0.83-0.83
	serum ESR(30mm/hr)	2H/4M	1.58-6.7	0.12(0.08,0.20)	0.73-0.96	0.39-0.88
	serum ESR(32mm/hr)	2M	2.64-7.69	0.19-0.21	0.81-0.87	0.67-0.89
	serum ESR(45mm/hr)	1M	4.75-4.75	0.22-0.22	0.82-0.82	0.83-0.83
	serum ESR(46.5 mm/hr)	1M	6.73-6.73	0.15-0.15	0.87-0.87	0.87-0.87
	serum ESR(48.5mm/hr)	1M	7.81-7.81	0.25-0.25	0.78-0.78	0.9-0.9
	serum ESR(50mm/hr)	1M	3.75-9.6	0.43-0.69	0.38-0.6	0.9-0.94
	serum ESR(54.5 mm/hr)	1M	11.36-11.36	0.22-0.22	0.8-0.8	0.93-0.93
Knee	serum ESR(22.5mm/hr)	1H	5.5-5.5	0.08-0.08	0.93-0.93	0.83-0.83
	serum ESR(30mm/hr)	2H/1M	2.66-6.7	0.09-0.2	0.82-0.94	0.66-0.88
	serum ESR(46.5 mm/hr)	1M	6.73-6.73	0.15-0.15	0.87-0.87	0.87-0.87
Hip/Knee	serum ESR in patients with inflammatory arthritis(30mm/hr)	1M	2.34-2.34	0.09-0.09	0.95-0.95	0.6-0.6
	serum ESR(32mm/hr)	2M	2.64-7.69	0.19-0.21	0.81-0.87	0.67-0.89
	serum ESR(45mm/hr)	1M	4.75-4.75	0.22-0.22	0.82-0.82	0.83-0.83
	serum ESR(54.5 mm/hr)	1M	11.36-11.36	0.22-0.22	0.8-0.8	0.93-0.93

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Hip	serum ESR in patients with dual taper modular implants with taper corrosion(22mm/h)	1L	10.48-10.48	0.45-0.45	0.57-0.57	0.95-0.95
	serum ESR(15mm/hr)	1M	0.94-1.07	0.91-1.09	0.56-0.6	0.4-0.44
	serum ESR(30mm/hr)	4M	1.58-5.27	0.08-0.32	0.73-0.96	0.39-0.86
	serum ESR(48.5mm/hr)	1M	7.81-7.81	0.25-0.25	0.78-0.78	0.9-0.9
	serum ESR(50mm/hr)	1M	3.75-9.6	0.43-0.69	0.38-0.6	0.9-0.94

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 33: Serum ESR- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Alijanipour,P., 2013	Moderate Quality	759	serum erythrocyte sedimentation rate (ESR)(overall pji)(30 mm/hour)	MSIS excluding ESR and CRP	0.94|0.68	2.97|0.09	WEAK	**STRONG**
Alijanipour,P., 2013	Moderate Quality	759	serum erythrocyte sedimentation rate (ESR)(overall pji)(46.5 mm/hour)	MSIS excluding ESR and CRP	0.87|0.87	6.73|0.15	**MODERATE**	**MODERATE**
Greidanus,NV,2007	High Quality	151	serum ESR (22.5 mm/hr)	Cultures –Intraoperative or Aspiration	0.93|0.83	5.5|0.08	**MODERATE**	**STRONG**
Greidanus,NV,2007	High Quality	151	serum ESR (30 mm/hr)	Cultures –Intraoperative or Aspiration	0.82|0.88	6.7|0.2	**MODERATE**	**MODERATE**
Della,Valle,CJ,2007	High Quality	94	serum ESR(30 mm/hr)	at least 2 of 3 positive intraoperative cultures on solid media or if 2 of following: 1)at least 1 positive culture 2)final histopathology consistent with infection 3)gross purulence seen at time of revision	0.9|0.66	2.66|0.15	WEAK	**MODERATE**

Table 34: Serum ESR- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Abou El-Khier,N.T., 2013	Moderate Quality	40	serum ESR(45 mm/hour)	intraoperative tissue samples	0.82|0.83	4.75|0.22	WEAK	WEAK
Alijanipour,P., 2013	Moderate Quality	1949	serum erythrocyte sedimentation rate (ESR)(early PJI within 4 weeks)(54.5 mm/hour)	MSIS excluding ESR and CRP	0.80|0.93	11.36|0.22	**STRONG**	WEAK
Bottner,F,2007	Moderate Quality	78	serum ESR (32 mm/hr)	Intraoperative cultures and histology	0.81|0.89	7.69|0.21	**MODERATE**	WEAK
Cipriano,C.A., 2012	Moderate Quality	61	serum ESR in patients with inflammatory arthritis(30 mm/hr)	two positive cultures of specimens from the joint, or 2/3 of criteria: the presence of a sinus tract or gross purulence at the time of revision, one positive deep culture, or histopathological findings consistent with infection with a mean of more than ten polymorphonuclear cells in the five most cellular fields examined	0.95|0.60	2.34|0.09	WEAK	**STRONG**

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Cipriano,C.A., 2012	Moderate Quality	810	serum ESR in patients with noninflammatory arthritis(32 mm/hr)	two positive cultures of specimens from the joint, or 2/3 of criteria: the presence of a sinus tract or gross purulence at the time of revision, one positive deep culture, or histopathological findings consistent with infection with a mean of more than ten polymorphonuclear cells in the five most cellular fields examined	0.87|0.67	2.64|0.19	WEAK	**MODERATE**
Elgeidi,A., 2014	Moderate Quality	40	serum ESR (mm/hour)(45)	purulence, sinus tract, 2 positive intra-op cultures or 1 positive culture for virulent microorganism	0.82|0.83	4.75|0.22	WEAK	WEAK

Table 35: Serum ESR- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Alijanipour,P., 2013	Moderate Quality	1203	serum erythrocyte sedimentation rate (ESR)(overall pji)(30 mm/hour)	MSIS excluding ESR and CRP	0.94|0.71	3.28|0.08	WEAK	**STRONG**
Alijanipour,P., 2013	Moderate Quality	1203	serum ESR + CRP (overall pji)(48.5mm/hr, 13.5mg/L)	MSIS excluding ESR and CRP	0.75|0.84	4.69|0.30	WEAK	WEAK
Alijanipour,P., 2013	Moderate Quality	1203	serum erythrocyte sedimentation rate (ESR)(overall pji)(48.5 mm/hour)	MSIS excluding ESR and CRP	0.78|0.90	7.81|0.25	**MODERATE**	WEAK
Buttaro,M.A., 2010	Moderate Quality	69	serum ESR()	positive histology or culture	0.73|0.86	5.27|0.32	**MODERATE**	WEAK
Kamme,C,1981	Moderate Quality	63	serum ESR (30mm/hr)	Intraoperative Cultures	0.89|0.72	3.2|0.15	WEAK	**MODERATE**
Kwon,Y.M., 2016	Low Quality	62	Serum ESR(22mm/h (optimal cutoff))	MSIS criteria	0.571428|0.945454	10.47619|0.453296	**STRONG**	WEAK
Savarino,L,2004	Moderate Quality	26	serum ESR (15mm/hr)	Intraoperative Cultures	0.56|0.4	0.94|1.09	POOR	POOR

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Savarino,L,2004	Moderate Quality	26	serum ESR (15mm/hr)	Histology	0.58|0.43	1.02|0.97	POOR	POOR
Savarino,L,2004	Moderate Quality	26	serum ESR (15mm/hr)	Intraoperative cultures and histology	0.6|0.44	1.07|0.91	POOR	POOR
Savarino,L,2004	Moderate Quality	26	serum ESR (50 mm/hr)	Intraoperative Cultures	0.38|0.9	3.75|0.69	WEAK	POOR
Savarino,L,2004	Moderate Quality	26	serum ESR(50 mm/hr)	Histology	0.5|0.93	7|0.54	**MODERATE**	POOR
Savarino,L,2004	Moderate Quality	26	serum ESR (50 mm/hr)	Intraoperative cultures and histology	0.6|0.94	9.6|0.43	**MODERATE**	WEAK
Schinsky,MF,2008	Moderate Quality	201	serum ESR (30 mm/hr)	at least 2 of: 1)a positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathological result consistent with infection (average of >10 PMN in the 5 most cellular high power fields)	0.96|0.39	1.58|0.09	POOR	**STRONG**

Figure 32: Meta-Analysis ROC Curve – ESR 30mm/HR (3 hip and 3 knee studies):

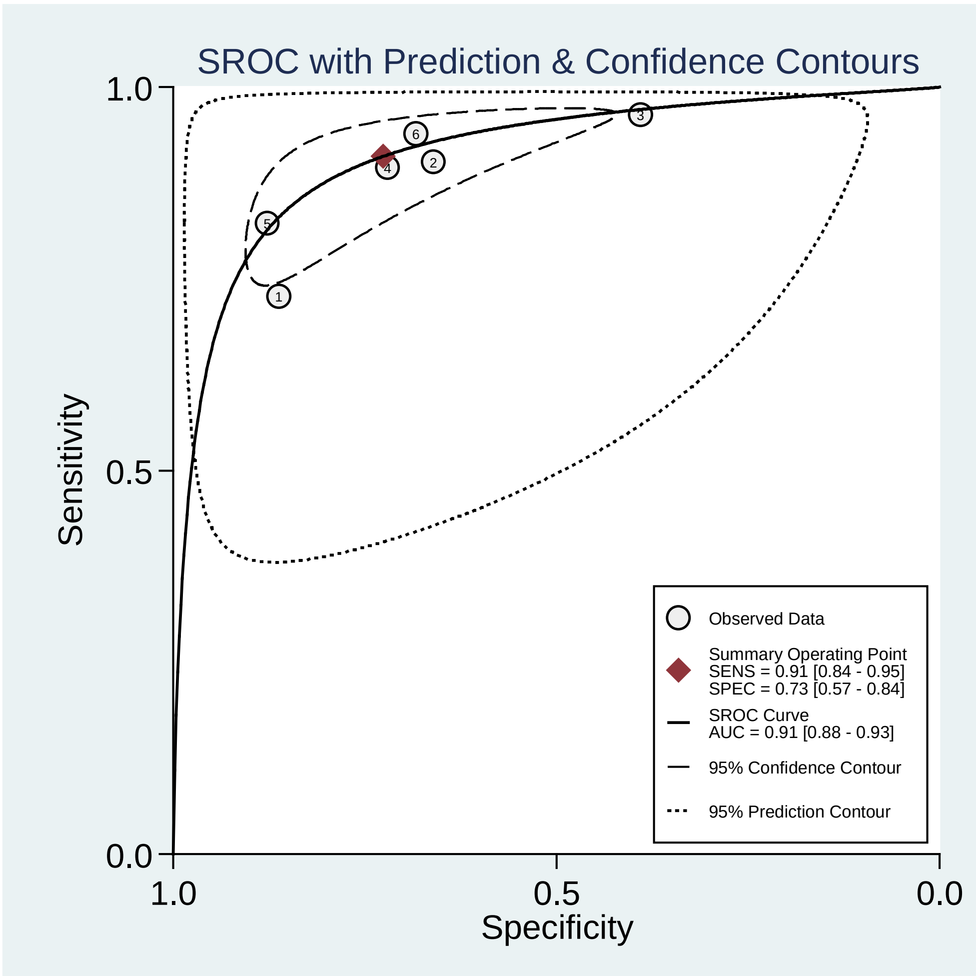


Figure 33: Meta-Analysis Forest Plot- ESR 30mm/HR (3 hip and 3 knee studies):

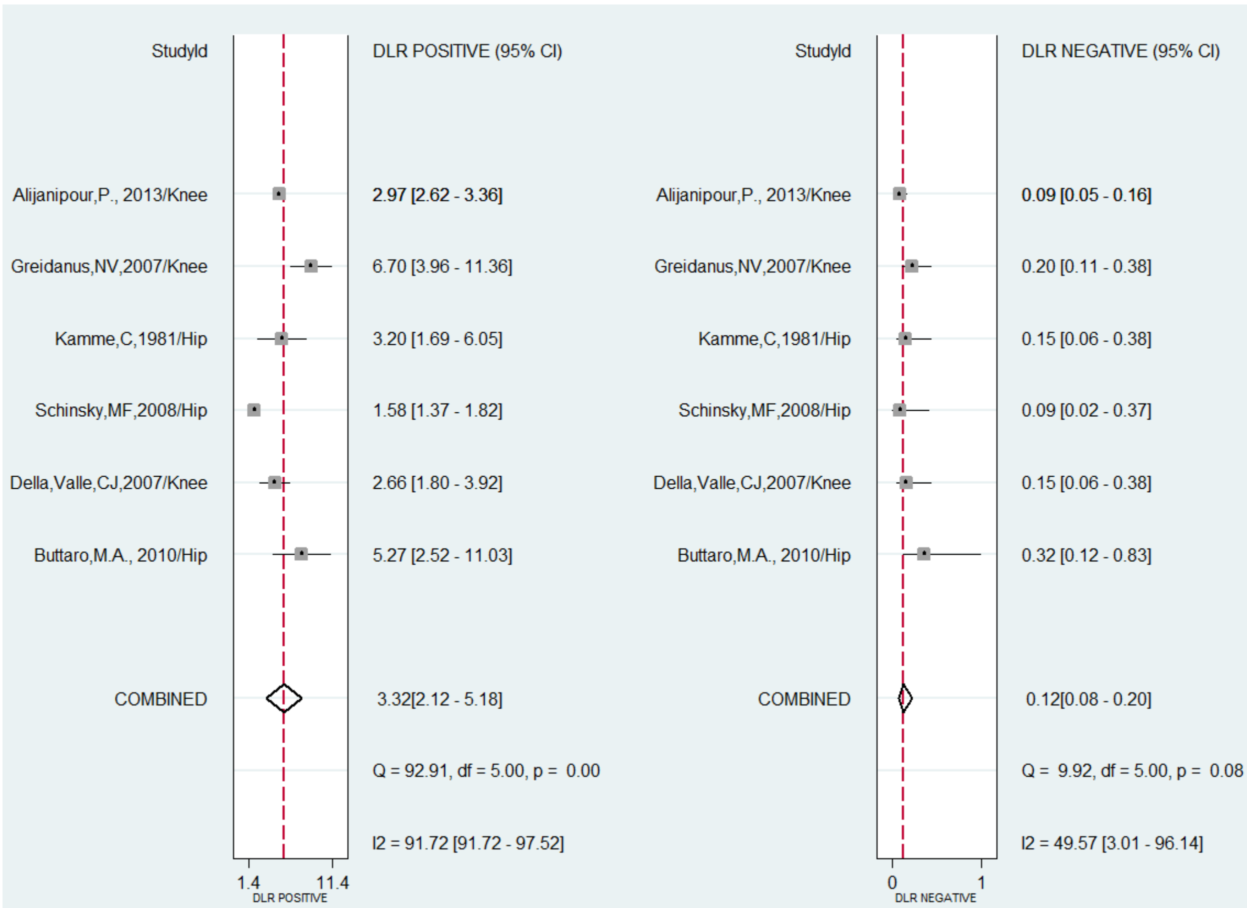


Figure 34: Meta-Analysis ROC Curve – ESR 30mm/HR (4 hip studies)

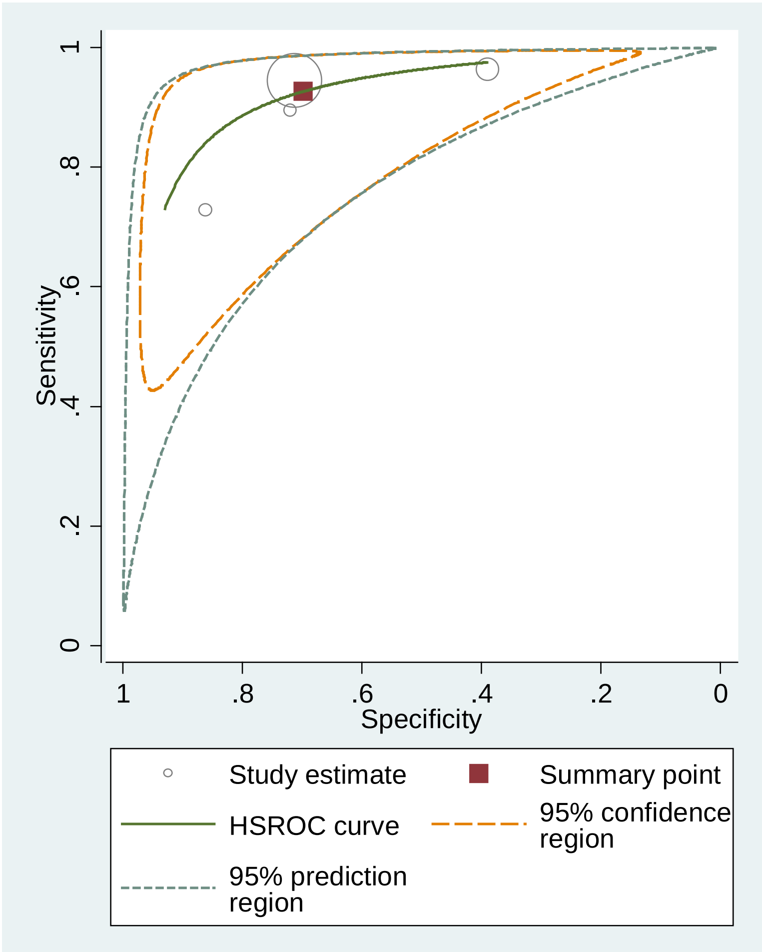


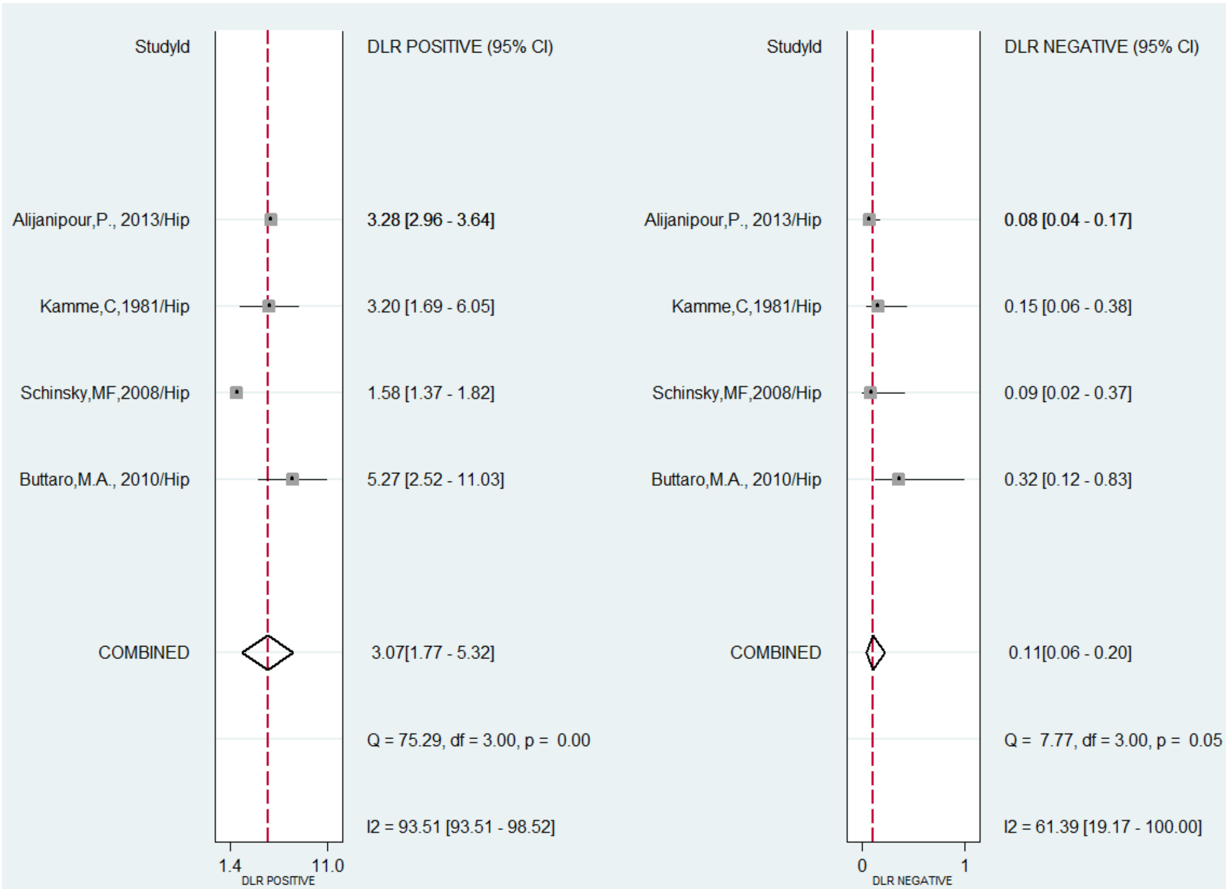
Table 36: Meta-analysis statistics: ESR 30mm/HR (4 hip studies):

Log likelihood = -24.900898 Number of studies = 4

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	2.529447	.458493			1.630817	3.428076
E(logitSp)	.8395962	.4375085			-.0179046	1.697097
Var(logitSe)	.5323408	.7113861			.0387881	7.30602
Var(logitSp)	.6858913	.5368506			.1479162	3.180497
Corr(logits)	-1	.			.	.
HSROC						
Lambda	3.482946	.5909241			2.324756	4.641136
Theta	.9534225	.6423865			-.3056319	2.212477
beta	.1267177	.5731617	0.22	0.825	-.9966585	1.250094
s2alpha	0	.			.	.
s2theta	.6042582	.5638399			.0970414	3.762599
Summary pt.						
Se	.9261805	.0313472			.8362815	.9685706
Sp	.6983802	.0921591			.495524	.8451552
DOR	29.05071	8.656541			16.20001	52.09524
LR+	3.070688	.8596646			1.773923	5.315409
LR-	.105701	.0351122			.0551217	.2026913
1/LR-	9.46065	3.142683			4.933611	18.14166

Covariance between estimates of E(logitSe) & E(logitSp) -.1564186

Figure 35: Meta-Analysis Forest Plot- ESR 30mm/HR (4 hip studies):



Evidence Summary: Serum CRP

There were two high quality studies, eleven moderate and 1 low quality article evaluating serum CRP(Della Valle 2007;Greidanus 2007;Alijanipour 2013;Bottner 2007;Buttaro 2010;Cipriano 2012;Elgeidi 2014;Fernandez-Sampedro 2017;Fink 2008;Fink 2013;Savarino 2004;Schinsky 2008;Yuan 2015;Kwon 2016). There were five hip and knee studies(Alijanipour 2013;Bottner 2007;Cipriano 2012;Elgeidi 2014;Fernandez-Sampedro 2017); seven hip studies(Alijanipour 2013;Buttaro 2010;Fink 2013;Savarino 2004;Schinsky 2008;Yuan 2015;Kwon 2016) and four knee studies(Della Valle 2007;Greidanus 2007;Alijanipour 2013;Fink 2008).

The most common positivity threshold used was 10mg/L, and a meta-analysis was conducted at that cut point. Visual inspection of the likelihood ratio forest plots in figure 6 revealed that the negative LRs may vary between joint location, and there seemed to be more heterogeneity in the hip studies than the knee studies. Therefore, a meta-regression was done using joint location as a covariate to explain heterogeneity. The analysis revealed a significant difference in specificity between hip and knee studies ($p<.01$). Also, the difference in sensitivity was quite large (16%), even though not statistically significant. Because of these differences, hip and knee studies were meta-analyzed separately.

Estimates of positive likelihood ratios did not vary much by joint. In the combined analysis using both hip and knee studies (figure 6 and table 6), the likelihood ratio for a threshold of 10mg/L was 4.1(3.5,4.9), indicating a small but sometimes important increase in probability of PJI. Stratifying by joint location did not change positive LR estimates much, with positive LR's of 3.8 and 3.9 for knee and hip studies respectively. The effect of study joint location on heterogeneity was more evident in estimates of the negative likelihood ratio. The three knee studies(Della Valle 2007;Greidanus 2007;Alijanipour 2013) produced consistent negative likelihood ratios between .05 and .08. The pooled negative LR was .07, indicating a strong rule out test where a negative result produced a large decrease in probability of PJI. A meta-analysis of the four hip studies still revealed substantial heterogeneity of negative LR's beyond what can be explained by joint location, producing an I-squared of 85.6%(figure 8). Due to inconsistency, it is more appropriate to present hip results using a range, rather than a single pooled estimate. At a threshold of 10mg/L, negative LR's ranged from .08(strong rule out test) to .48(weak rule out test) in hip studies.

For knee studies, testing for early and late PJI combined, the only other threshold tested was 13.5mg/L (Greidanus 2007, high quality). This threshold was a moderate rule-in test (positive LR=6.9) and a strong rule-out test (negative LR=.1). That is, a positive test produced a moderate increase in probability of PJI and a negative test produced a large decrease in probability of PJI.

For hip studies, other thresholds evaluated were 5mg/L ,20mg/L (Savarino 2004) and 15mg/L(Yuan 2015). Both studies were moderate quality. 5mg/L was a poor rule in and rule out test, with positive LR's ranging from .8 to 1.25, and negative LR's ranging from 0.89 to 1.12. The threshold of 15mg/L was a weak rule in and rule out test (positive LR=2.69, negative LR=.33), meaning the test produced a small but sometimes important change in probability of PJI. Savarino, a moderate quality study, evaluated a threshold of 20 mg/L in hip patients using various reference standards, including cultures, histology and combined cultures and histology. Testing CRP against all three reference standards showed 20mg/L to be a poor rule out test, with negative likelihood ratios of.72 or higher. Using combined cultures and histology as the reference standard, CRP of 20mg/L produced a small, but sometimes important increase in probability of PJI, with a positive LR of 2.4.

Two moderate quality studies with mixed hip and knee populations evaluated thresholds of 15mg/L, 32mg/L (Bottner 2007) and 18mg/L(Elgeidi 2014). Both studies had strong negative likelihood ratios, suggesting that a negative test resulted in a strong decrease in probability of PJI. Eglidi evaluated 18mg/L as a threshold, which suggested a positive test resulted in a moderately strong increase in probability of PJI(positive LR=7.25). Bottner et al used 15 and 32mg/l as positive thresholds, and found that a positive test at each threshold produced a strong increase in probability of PJI (positive LR of 10.86 to 27.14 respectively). However, given the mixed hip/knee populations, and the heterogeneity found in the previously mentioned meta regression, it is unclear to what extent these results were influenced by joint location.

Cipriano(2012), a moderate quality study, did a separate subgroup analysis of a CRP of 17mg/L in patients with inflammatory arthritis. A positive test resulted in a small but sometimes important increase in probability of PJI in these patients(positive LR=3.32). A negative test produced a large decrease in probability of PJI(negative LR=.07)

Kwon(2016) evaluated a CRP of 31.3mg/L in patients with dual taper modular implants with taper corrosion. In this patient population, the test produced a small, but sometimes important increase in probability of PJI(positive LR=3.93). However, CRP was a poor rule out test in this population(negative LR=.77).

CRP timing of infection

Four moderate quality studies stratified CRP tests by early and late occurring infection. Late infection was defined as over four weeks in two studies (Alijanipour 2013; Fink 2008), over three months in one study (Fernandez-Sampedro 2017), and unclear in one study (Cipriano). One knee (Fink 2008) and one hip study(Alijanipour 2013) used a threshold of 13.5mg/L to define infection after four weeks. This threshold produced a small(but sometimes important) change in probability of late infection in knee patients(positive LR=3.81,negative LR=.34), and a moderate change in probability of late PJI in hip patients (positive LR=7.51, negative LR=.12). Alijanipour evaluated a CRP threshold of 23.5mg/L in knee patients, which had a strong change in probability of late infection after four weeks(positive LR=15.2, negative LR=.08). The same study evaluated the ability of a CRP of 23.5 in mixed hip/knee patients to diagnose early PJI (within four weeks). A positive test produced a strong increase in probability of PJI(positive LR=14.47), and a negative result produced a moderate decrease in probability of PJI(negative LR=.14).

Table 37: Summary of Findings serum CRP

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	serum CRP in patients with dual taper modular implants with taper corrosion(31.3mg/L)	1L	3.93-3.93	0.77-0.77	0.29-0.29	0.93-0.93
	serum CRP in patients with inflammatory arthritis(17mg/L)	1M	3.32-3.32	0.07-0.07	0.95-0.95	0.71-0.71
	serum CRP(5mg/L)	1M	0.8-1.25	0.89-1.12	0.3-0.38	0.63-0.7
	serum CRP(10mg/L)	2H/5M	4.1(3.5,4.9)	0.05-0.48	0.62-0.96	0.7-0.91
	serum CRP(13.5mg/L)	1H/2M	3.81-7.51	0.1-0.34	0.73-0.91	0.81-0.88
	serum CRP(15mg/L)	3M	2.69-10.86	0.05-0.33	0.76-0.95	0.72-0.91
	serum CRP(18mg/L)	1M	7.25-7.25	0-0	1-1	0.86-0.86
	serum CRP(20mg/L)	1M	0.94-4.67	0.72-1.02	0.19-0.33	0.8-0.93
	serum CRP(23.5mg/L)	1M	14.47-15.2	0.08-0.14	0.87-0.92	0.94-0.94
	serum CRP(32mg/L)	1M	27.14-27.14	0.05-0.05	0.95-0.95	0.96-0.96
Knee	serum CRP(10mg/L)	2H/1M	3.23-5.5	0.05-0.08	0.93-0.96	0.7-0.83
	serum CRP(13.5mg/L)	1H/1M	3.81-6.9	0.1-0.34	0.73-0.91	0.81-0.87
	serum CRP(23.5mg/L)	1M	15.2-15.2	0.08-0.08	0.92-0.92	0.94-0.94
Hip/Knee	serum CRP in patients with inflammatory arthritis(17mg/L)	1M	3.32-3.32	0.07-0.07	0.95-0.95	0.71-0.71
	serum CRP(10mg/L)	1M	3.52-6.35	0.2-0.45	0.62-0.83	0.77-0.87
	serum CRP(15mg/L)	2M	5.17-10.86	0.05-0.17	0.86-0.95	0.83-0.91
	serum CRP(18mg/L)	1M	7.25-7.25	0-0	1-1	0.86-0.86
	serum CRP(23.5mg/L)	1M	14.47-14.47	0.14-0.14	0.87-0.87	0.94-0.94
	serum CRP(32mg/L)	1M	27.14-27.14	0.05-0.05	0.95-0.95	0.96-0.96
Hip	serum CRP in patients with dual taper modular implants with taper corrosion(31.3mg/L)	1L	3.93-3.93	0.77-0.77	0.29-0.29	0.93-0.93
	serum CRP(5mg/L)	1M	0.8-1.25	0.89-1.12	0.3-0.38	0.63-0.7
	serum CRP(10mg/L)	4M	3.9(3.3, 4.6)	0.08-0.48	0.64-0.95	0.71-0.91
	serum CRP(13.5mg/L)	1M	7.51-7.51	0.12-0.12	0.9-0.9	0.88-0.88
	serum CRP(15mg/L)	1M	2.69-2.69	0.33-0.33	0.76-0.76	0.72-0.72

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
	serum CRP(20mg/L)	1M	0.94-4.67	0.72-1.02	0.19-0.33	0.8-0.93

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 38: Serum CRP- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Alijanipour,P., 2013	Moderate Quality	759	serum C-reactive protein (CRP)(overall pji)(10 mg/L)	MSIS excluding ESR and CRP	0.96|0.70	3.23|0.05	WEAK	**STRONG**
Alijanipour,P., 2013	Moderate Quality	759	serum C-reactive protein (CRP)(overall pji)(23.5 mm/hour)	MSIS excluding ESR and CRP	0.92|0.94	15.20|0.08	**STRONG**	**STRONG**
Fink,B,2008	Moderate Quality	145	serum CRP (1.35 mg/dL)	Intraoperative cultures and histology	0.73|0.81	3.81|0.34	WEAK	WEAK
Greidanus,NV,2007	High Quality	151	serum CRP (1.0 mg/dL)	Cultures –Intraoperative or Aspiration	0.93|0.83	5.5|0.08	**MODERATE**	**STRONG**
Greidanus,NV,2007	High Quality	151	serum CRP (1.35 mg/dL)	Cultures –Intraoperative or Aspiration	0.91|0.87	6.9|0.1	**MODERATE**	**STRONG**
Della,Valle,CJ,2007	High Quality	94	serum CRP (1 mg/dL)	at least 2 of 3 positive intraoperative cultures on solid media or if 2 of following: 1)at least 1 positive culture 2)final histopathology consistent with infection 3)gross purulence seen at time of revision	0.95|0.75	3.88|0.06	WEAK	**STRONG**

Table 39: Serum CRP- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Abou El-Khier,N.T., 2013	Moderate Quality	40	serum CRP(18 mg/L)	intraoperative tissue samples	1.00|0.86	7.25|0.00	**MODERATE**	**STRONG**
Alijanipour,P., 2013	Moderate Quality	1949	serum C-reactive protein (CRP)(early PJI within 4 weeks)(23.5 mm/hour)	MSIS excluding ESR and CRP	0.87|0.94	14.47|0.14	**STRONG**	**MODERATE**
Bottner,F,2007	Moderate Quality	78	serum CRP (1.5 mg/dL)	Intraoperative cultures and histology	0.95|0.91	10.86|0.05	**STRONG**	**STRONG**
Bottner,F,2007	Moderate Quality	78	serum CRP (3.2 mg/dL)	Intraoperative cultures and histology	0.95|0.96	27.14|0.05	**STRONG**	**STRONG**
Cipriano,C.A., 2012	Moderate Quality	61	serum CRP in patients with inflammatory arthritis(17 mg/L)	two positive cultures of specimens from the joint, or 2/3 of criteria: the presence of a sinus tract or gross purulence at the time of revision, one positive deep culture, or histopathological findings consistent with infection with a mean of more than ten polymorphonuclear cells in the five most cellular fields examined	0.95|0.71	3.32|0.07	WEAK	**STRONG**

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Cipriano,C.A., 2012	Moderate Quality	810	serum CRP in patients with noninflammatory arthritis(15 mg/L)	two positive cultures of specimens from the joint, or 2/3 of criteria: the presence of a sinus tract or gross purulence at the time of revision, one positive deep culture, or histopathological findings consistent with infection with a mean of more than ten polymorphonuclear cells in the five most cellular fields examined	0.86|0.83	5.17|0.17	**MODERATE**	**MODERATE**
Elgeidi,A., 2014	Moderate Quality	40	serum CRP (mg/L)(18)	purulence, sinus tract, 2 positive intra-op cultures or 1 positive culture for virulent microorganism	1.00|0.86	7.25|0.00	**MODERATE**	**STRONG**

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Fernandez-Sampedro,M., 2017	Moderate Quality	495	Serum CRP(all)(over 1)	(i) visible purulence surrounding the prosthesis, (ii) acute inflammation on histopathologic examination of permanent tissue sections, (iii) a sinus tract communicating with the prosthesis (iv) two or more cultures of joint aspirates or cultures of intraoperative tissue specimens yielded the same microorganism when S. aureus or S. lugdunensis were the microorganisms isolated, only a single positive tissue specimen was required.	0.70|0.84	4.48|0.36	WEAK	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Fernandez-Sampedro,M., 2017	Moderate Quality	29	Serum CRP(less than 3 months after surgery)(over 1)	(i) visible purulence surrounding the prosthesis, (ii) acute inflammation on histopathologic examination of permanent tissue sections, (iii) a sinus tract communicating with the prosthesis (iv) two or more cultures of joint aspirates or cultures of intraoperative tissue specimens yielded the same microorganism when S. aureus or S. lugdunensis were the microorganisms isolated, only a single positive tissue specimen was required.	0.81|0.77	3.52|0.24	WEAK	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Fernandez-Sampedro,M., 2017	Moderate Quality	58	Serum CRP(3-12 months after surgery)(over 1)	(i) visible purulence surrounding the prosthesis, (ii) acute inflammation on histopathologic examination of permanent tissue sections, (iii) a sinus tract communicating with the prosthesis (iv) two or more cultures of joint aspirates or cultures of intraoperative tissue specimens yielded the same microorganism when S. aureus or S. lugdunensis were the microorganisms isolated, only a single positive tissue specimen was required.	0.83|0.87	6.35|0.20	**MODERATE**	**MODERATE**

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Fernandez-Sampedro,M., 2017	Moderate Quality	408	Serum CRP(over a year after surgery)(over 1)	(i) visible purulence surrounding the prosthesis, (ii) acute inflammation on histopathologic examination of permanent tissue sections, (iii) a sinus tract communicating with the prosthesis (iv) two or more cultures of joint aspirates or cultures of intraoperative tissue specimens yielded the same microorganism when S. aureus or S. lugdunensis were the microorganisms isolated, only a single positive tissue specimen was required.	0.62|0.85	4.05|0.45	WEAK	WEAK

Table 40: Serum CRP- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Alijanipour,P., 2013	Moderate Quality	1203	serum C-reactive protein (CRP)(overall pji)(10 mg/L)	MSIS excluding ESR and CRP	0.88|0.77	3.90|0.16	WEAK	**MODERATE**
Alijanipour,P., 2013	Moderate Quality	1203	serum C-reactive protein (CRP)(overall pji)(13.5 mm/hour)	MSIS excluding ESR and CRP	0.90|0.88	7.51|0.12	**MODERATE**	**MODERATE**
Buttaro,M.A., 2010	Moderate Quality	69	serum CRP(10 mg/L)	positive histology or culture	0.73|0.91	8.44|0.30	**MODERATE**	WEAK
Fink,B., 2013	Moderate Quality	100	serum CRP(10 mg/L)	intraoperative samples	0.64|0.75	2.53|0.48	WEAK	WEAK
Kwon,Y.M., 2016	Low Quality	62	serum CRP(3.13mg/dL (optimal cutoff))	MSIS criteria	0.285714|0.927272	3.928571|0.770308	WEAK	POOR
Savarino,L,2004	Moderate Quality	26	serum CRP (0.5mg/dL)	Intraoperative Cultures	0.38|0.7	1.25|0.89	POOR	POOR
Savarino,L,2004	Moderate Quality	26	serum CRP (0.5mg/dL)	Histology	0.33|0.64	0.93|1.04	POOR	POOR
Savarino,L,2004	Moderate Quality	26	serum CRP(0.5mg/dL)	Intraoperative cultures and histology	0.3|0.63	0.8|1.12	POOR	POOR
Savarino,L,2004	Moderate Quality	26	serum CRP (2 mg/dL)	Intraoperative Cultures	0.19|0.8	0.94|1.02	POOR	POOR
Savarino,L,2004	Moderate Quality	26	serum CRP (2 mg/dL)	Histology	0.33|0.93	4.67|0.72	WEAK	POOR

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Savarino,L,2004	Moderate Quality	26	serum CRP (2 mg/dL)	Intraoperative cultures and histology	0.3|0.88	2.4|0.8	WEAK	POOR
Schinsky,MF,2008	Moderate Quality	201	serum CRP (1 mg/dL)	at least 2 of: 1)a positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathological result consistent with infection (average of >10 PMN in the 5 most cellular high power fields)	0.95|0.71	3.29|0.08	WEAK	**STRONG**
Yuan,K., 2015	Moderate Quality	74	serum CRP(15 mg/L)	The final diagnosis of PJI required two of the following three criteria to be met: At least one positive culture on solidmedium grown from intra-operative specimens; purulence surrounding the prosthesis observed at the time of debridement or removal of the prosthesis; acute inflammation consistent with infection present during histopathologic examination	0.76|0.72	2.69|0.33	WEAK	WEAK

Figure 36: Meta-Analysis ROC Curve – CRP 10 mg/L (3 hip and 3 knee, 1hip/knee studies):

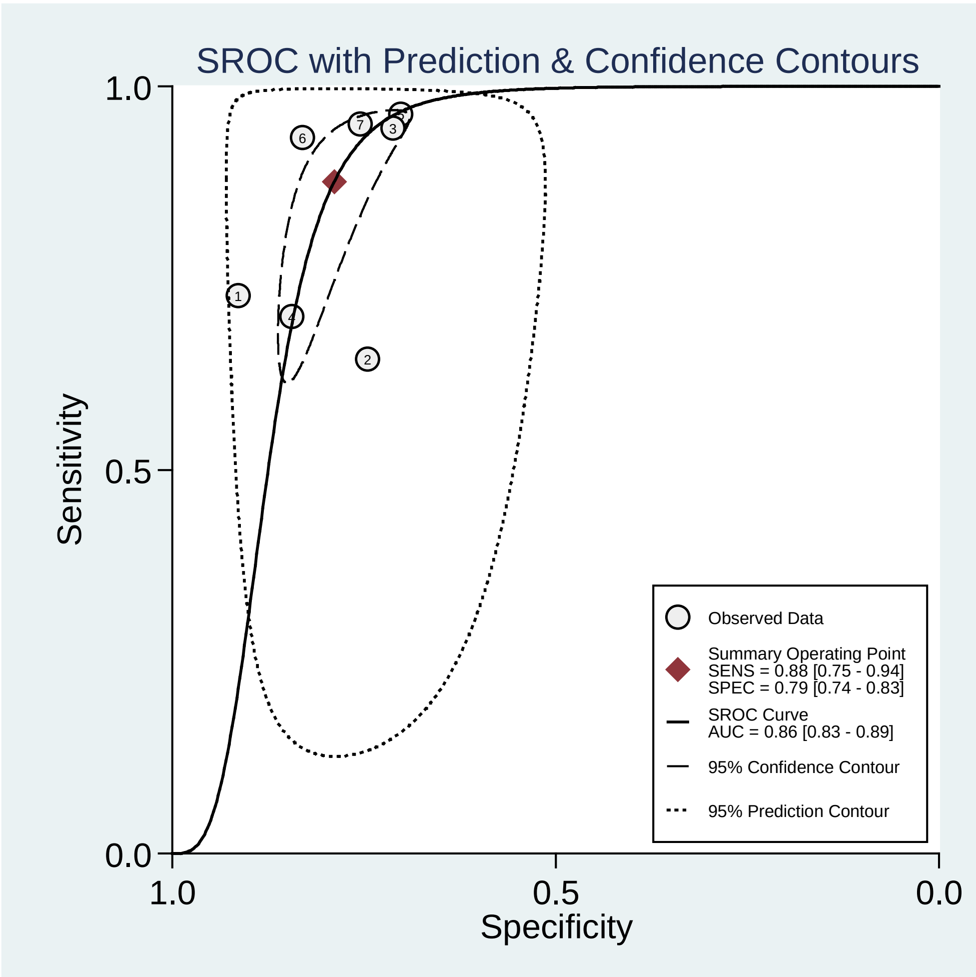


Figure 37: Meta-Analysis Forest Plot- CRP 10 mg/L (3 hip and 3 knee studies):

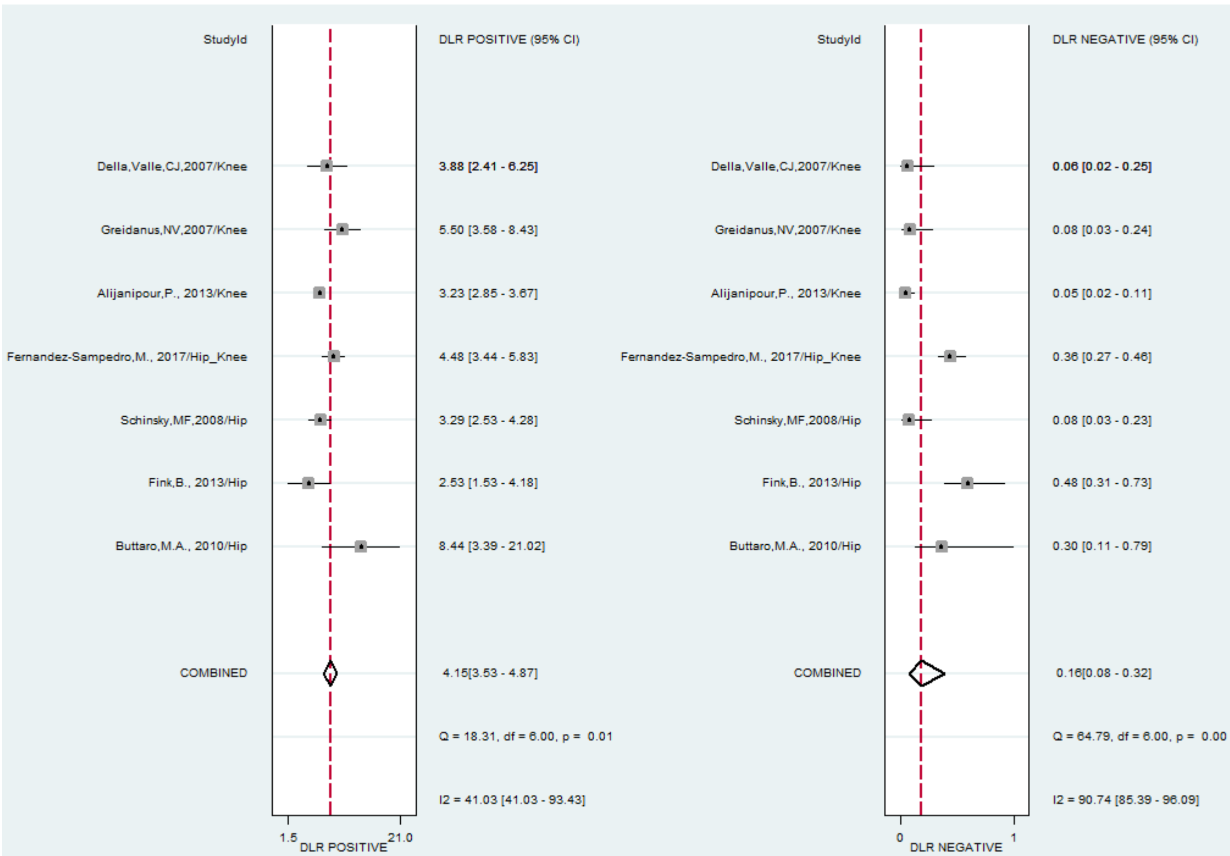


Figure 38: Meta-Analysis ROC Curve – CRP 10 mg/L (4 hip studies)

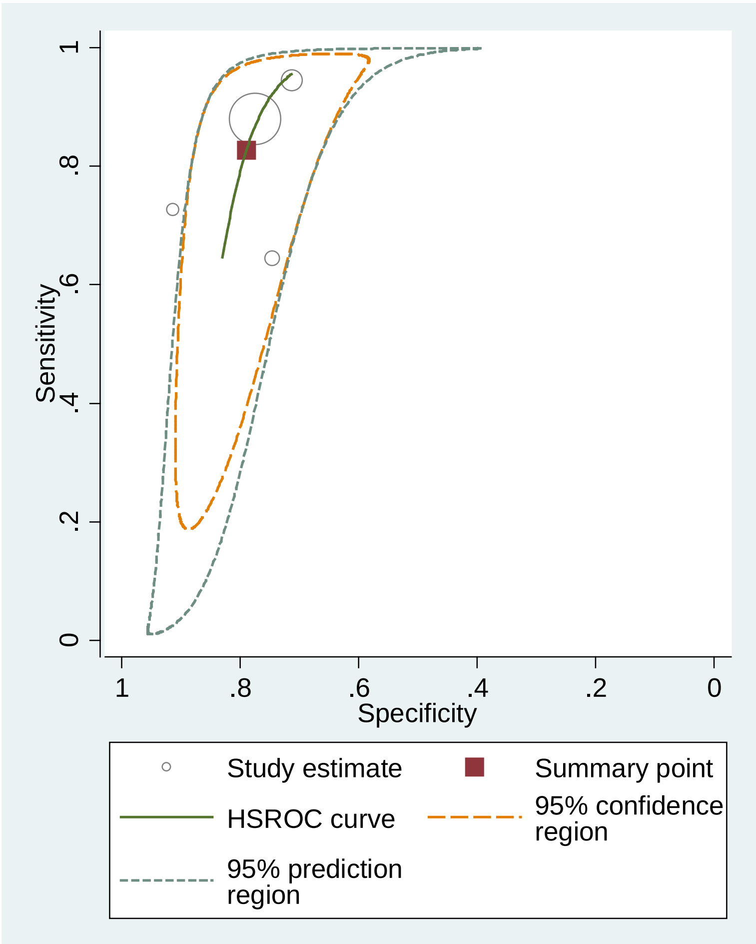


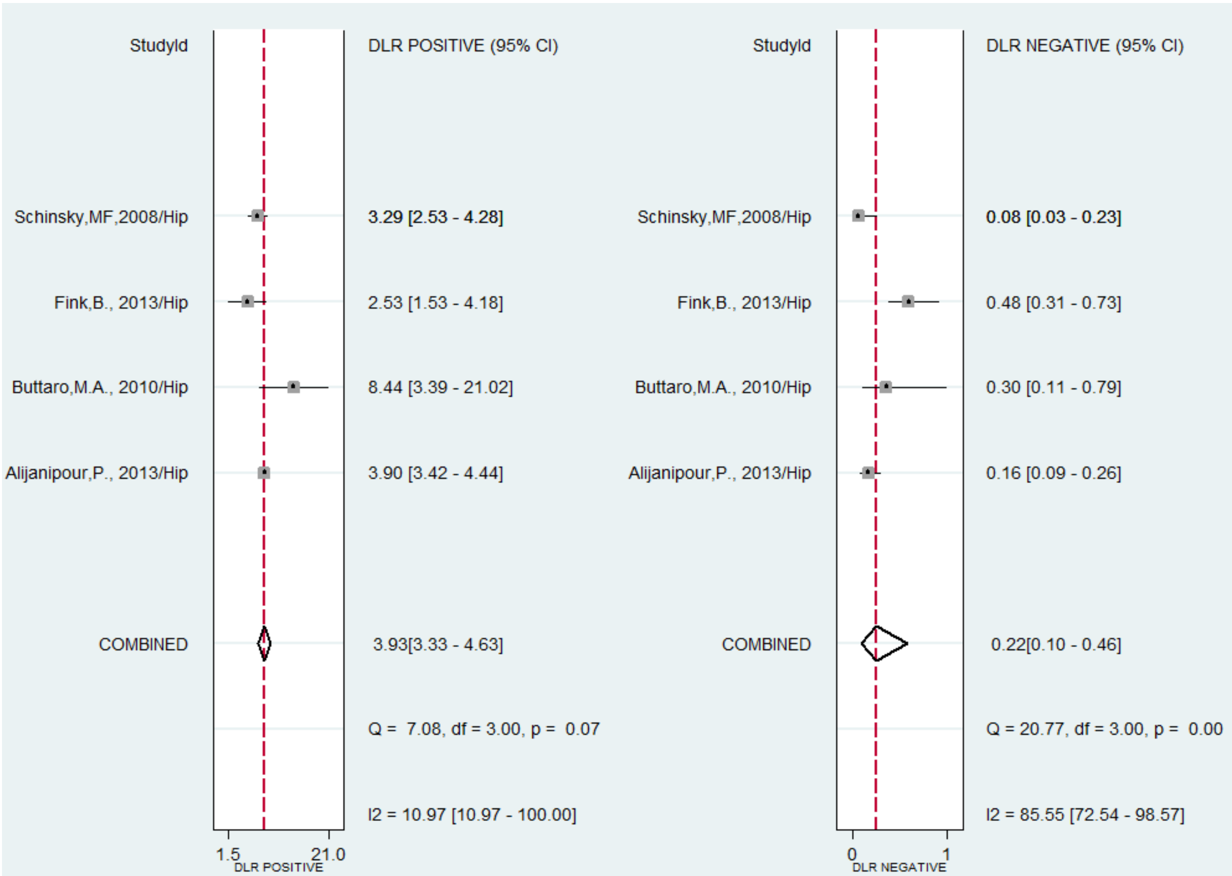
Table 41: Meta-analysis statistics: CRP 10 mg/L (4 hip studies)

Log likelihood = -26.177199 Number of studies = 4

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	1.564295	.4922365			.5995295	2.529061
E(logitSp)	1.322211	.1600509			1.008517	1.635905
Var(logitSe)	.7626639	.7007967			.125945	4.618334
Var(logitSp)	.0564774	.0818881			.0032938	.9683997
Corr(logits)	-1	.			.	.
HSROC						
Lambda	3.35066	.4986008			2.373421	4.3279
Theta	-.8593037	.5400043			-1.917693	.1990854
beta	-1.301488	.6626152	-1.96	0.050	-2.60019	-.0027862
s2alpha	0	.			.	.
s2theta	.2075411	.2110658			.0282778	1.523217
Summary pt.						
Se	.8269689	.0704348			.6455487	.9261542
Sp	.7895493	.0265943			.7327297	.8369769
DOR	17.93055	6.928947			8.4074	38.24068
LR+	3.929513	.3293014			3.334312	4.630962
LR-	.2191518	.0837946			.1035812	.4636703
1/LR-	4.563047	1.74472			2.156705	9.654264

Covariance between estimates of E(logitSe) & E(logitSp) -.0592915

Figure 39: Meta-Analysis Forest Plot- CRP 10 mg/L (4 hip studies):



Evidence Summary: Serum ESR + CRP

One high quality knee study (Greidanus 2007) and one moderate quality hip study(Schinsky 2008) evaluated combined serum ESR + CRP. Both studies evaluated their diagnostic ability when either test was positive and when both tests were positive.

If both ESR and CRP are negative, then there is a large decrease in probability of infection, making it a strong rule out test (negative LR range=0 to .06). If only one of the two tests is positive, this was a poor to weak rule out test(negative LR range= 1.74 to 4.22).

If both ESR and CRP are positive, then this produced a stronger increase in probability of infection than if only one of the tests were positive (positive LR range=4.34 to 13.5). However, using the criteria of positive ESR ***and*** CRP was a weaker rule out test than if either ESR ***or*** CRP were positive. Requiring both ESR and CRP to be positive only produced a moderate to small decrease in probability of infection if the criterion was not met (negative LR range=.12 to .21).

Table 42: Summary of Findings serum ESR + CRP

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	serum ESR + CRP (positive if one positive)(22.5mm/hr,13.5mg/L)	1H	4.22-4.22	0.06-0.06	0.96-0.96	0.77-0.77
	serum ESR + CRP (positive if one positive)(30mm/hr, 10 mg/L)	1H/1M	1.74-4.22	0-0.06	0.96-1	0.43-0.77
	serum ESR + CRP(positive if both positive)(22.5mm/hr,13.5mg/L)	1H	13.5-13.5	0.12-0.12	0.89-0.89	0.93-0.93
	serum ESR + CRP(positive if both positive)(30mm/hr, 10 mg/L)	1H/1M	4.34-12.1	0.14-0.21	0.8-0.89	0.79-0.93
Knee	serum ESR + CRP (positive if one positive)(22.5mm/hr,13.5mg/L)	1H	4.22-4.22	0.06-0.06	0.96-0.96	0.77-0.77
	serum ESR + CRP (positive if one positive)(30mm/hr, 10 mg/L)	1H	4.22-4.22	0.06-0.06	0.96-0.96	0.77-0.77
	serum ESR + CRP(positive if both positive)(22.5mm/hr,13.5mg/L)	1H	13.5-13.5	0.12-0.12	0.89-0.89	0.93-0.93
	serum ESR + CRP(positive if both positive)(30mm/hr, 10 mg/L)	1H	12.1-12.1	0.21-0.21	0.8-0.8	0.93-0.93
Hip	serum ESR + CRP (positive if one positive)(30mm/hr, 10 mg/L)	1M	1.74-1.74	0-0	1-1	0.43-0.43
	serum ESR + CRP(positive if both positive)(30mm/hr, 10 mg/L)	1M	4.34-4.34	0.14-0.14	0.89-0.89	0.79-0.79

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 43: serum ESR + CRP- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Greidanus,NV,2007	High Quality	151	serum ESR and CRP – positive if both positive (22.5/1.35)	Cultures –Intraoperative or Aspiration	0.89|0.93	13.5|0.12	**STRONG**	**MODERATE**
Greidanus,NV,2007	High Quality	151	serum ESR and CRP – positive if both positive (30/1.0)	Cultures –Intraoperative or Aspiration	0.8|0.93	12.1|0.21	**STRONG**	WEAK
Greidanus,NV,2007	High Quality	151	serum ESR and CRP – positive if one positive (22.5/1.35)	Cultures –Intraoperative or Aspiration	0.96|0.77	4.22|0.06	WEAK	**STRONG**
Greidanus,NV,2007	High Quality	151	serum ESR and CRP – positive if one positive (30/1.0)	Cultures –Intraoperative or Aspiration	0.96|0.77	4.22|0.06	WEAK	**STRONG**

Table 44: serum ESR + CRP- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Schinsky,MF,2008	Moderate Quality	201	serum ESR and CRP – positive if both positive (30/1.0)	At least 2 of: 1)positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	0.89|0.79	4.34|0.14	WEAK	**MODERATE**
Schinsky,MF,2008	Moderate Quality	201	serum ESR and CRP – positive if one positive (30/1.0)	At least 2 of: 1)positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	1|0.43	1.74|0	POOR	**STRONG**

Evidence Summary: Serum WBC

Five moderate and two low quality studies evaluated the diagnostic ability of serum WBC count(Bottner 2007;Elgeidi 2014;Savarino 2004;Spangehl 1999;Yuan 2015;Claassen 2016;Trampuz 2007). One study used knee patients(Claassen 2016); three used hip patients(Savarino 2004;Spangehl 1999;Yuan 2015) and three used both hip and knee patients(Bottner 2007;Elgeidi 2014;Trampuz 2007).

The studies used a wide range of positivity thresholds, ranging from 6.2*10^9/L to 11*10^9/L. The Summary of Findings for each cutpoint can be found in table 14. A meta-analysis was conducted. The summary ROC curve is displayed in figure 9, and produced an area under the curve(AUC) of .71, indicating moderate discriminatory ability. Using the parameters of the HSROC model in Table 19, positive and negative LR's were calculated at the median level of specificity of the included studies(sp=88.5%). At this level, WBC results produced a small, but sometimes important increase in probability of PJI, making it a weak rule in test(positive LR=2.92). However, serum WBC was a poor rule out test(negative LR=.74), with a negative test producing a small and rarely important decrease in probability of PJI.

One moderate quality hip study(Spangehl 1999) evaluated serum WBC differential, using 75% neutrophils as the cutoff. This test also produced a small, but sometimes important increase in probability of PJI if positive(positive LR=2.01). However, a negative test produced a very small and rarely important decrease in probability of PJI(negative LR=.87), making it a poor rule out test.

Table 45: Summary of Findings serum WBC

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	serum WBC (10*10^9/L for males; 9.1*10^9 for females)	1L	0-0	1.13-1.13	0-0	0.88-0.88
	serum WBC (10x10^9/L)	1L	3.11-3.11	0.87-0.87	0.18-0.18	0.94-0.94
	serum WBC (11.0x10^9/L)	1M	5.57-5.57	0.83-0.83	0.2-0.2	0.96-0.96
	serum WBC (6.2*10^9/L)	1M	1.77-1.77	0.48-0.48	0.71-0.71	0.6-0.6
	serum WBC (9.2*10^9/L)	1M	3.77-3.77	0.12-0.12	0.91-0.91	0.76-0.76
	serum WBC (9.5*10^9/L)	1M	1.94-4.64	0.89-0.96	0.06-0.1	1-1
	serum WBC differential (75% neutrophils)	1M	2.01-2.01	0.87-0.87	0.23-0.23	0.89-0.89
	serum polynuclear neutrophil count (6000 cells/ml)	1L	2.84-2.84	0.57-0.57	0.54-0.54	0.81-0.81
	serum WBC(10.5 x 10^9/L)	1M	1.4-1.4	0.66-0.66	0.64-0.64	0.54-0.54
Knee	serum WBC (10*10^9/L for males; 9.1*10^9 for females)	1L	0-0	1.13-1.13	0-0	0.88-0.88
Hip/Knee	serum WBC (10x10^9/L)	1L	3.11-3.11	0.87-0.87	0.18-0.18	0.94-0.94
	serum WBC (6.2*10^9/L)	1M	1.77-1.77	0.48-0.48	0.71-0.71	0.6-0.6
	serum WBC (9.2*10^9/L)	1M	3.77-3.77	0.12-0.12	0.91-0.91	0.76-0.76
	serum polynuclear neutrophil count (6000 cells/ml)	1L	2.84-2.84	0.57-0.57	0.54-0.54	0.81-0.81
Hip	serum WBC (11.0x10^9/L)	1M	5.57-5.57	0.83-0.83	0.2-0.2	0.96-0.96
	serum WBC (9.5*10^9/L)	1M	1.94-4.64	0.89-0.96	0.06-0.1	1-1
	serum WBC differential (75% neutrophils)	1M	2.01-2.01	0.87-0.87	0.23-0.23	0.89-0.89
	serum WBC(10.5 x 10^9/L)	1M	1.4-1.4	0.66-0.66	0.64-0.64	0.54-0.54

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 46: serum WBC- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Claassen,L., 2016	Low Quality	34	White mood cell count in serum(10.0 Tsd/ul female; 9.1 male)	intraoperative cultures positive in at least 2 of 5 samples or or when the histology proofed a type	0.00|0.88	0.00|1.13	POOR	POOR

Table 47: serum WBC- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Abou El-Khier,N.T., 2013	Moderate Quality	40	serum WBC(9.2 cell/109/L)	intraoperative tissue samples	0.91|0.76	3.77|0.12	WEAK	**MODERATE**
Bottner,F,2007	Moderate Quality	78	serum WBC (6200/microliter)	Intraoperative cultures and histology	0.71|0.6	1.77|0.48	POOR	WEAK
Elgeidi,A., 2014	Moderate Quality	40	serum WBC (cell/209/L)(9.2)	purulence, sinus tract, 2 positive intra-op cultures or 1 positive culture for virulent microorganism	0.91|0.76	3.77|0.12	WEAK	**MODERATE**
Trampuz,A,2007	Low Quality	296	serum WBC count (10x10^9/L)	at least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections (as determined by the clinical pathologist) 3)a sinus tract communicating with the prosthesis	0.18|0.94	3.11|0.87	WEAK	POOR

Table 48: serum WBC- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Savarino,L,2004	Moderate Quality	26	serum WBC (9500/mm^3)	Intraoperative cultures	0.06|1	1.94|0.96	POOR	POOR
Savarino,L,2004	Moderate Quality	26	serum WBC (9500/mm^3)	Histology	0.08|1	3.46|0.92	WEAK	POOR
Savarino,L,2004	Moderate Quality	26	serum WBC (9500/mm^3)	Intraoperative cultures and histology	0.1|1	4.64|0.89	WEAK	POOR
Spangehl,MJ,1999	Moderate Quality	202	serum WBC (11.0x10^9/L	at least 1 of: 1)open wound of sinus in communication with the joint 2)systemic infection with pain in the joint and purulent fluid within the joint 3)positive result on at least 3 investigations(ESR>30, CRP>10, preoperative aspiration with at least 1 positive culture, frozen section with >5PMN/HPF, intraoperative culture (>1/3 of cultures positive)	0.2|0.96	5.57|0.83	**MODERATE**	POOR
Spangehl,MJ,1999	Moderate Quality	202	serum WBC differential (75% neutrophils)	at least 1 of: 1)open wound of sinus in communication with the joint 2)systemic infection with pain in the joint and purulent fluid within the joint 3)positive result on at least 3 investigations(ESR>30, CRP>10, preoperative aspiration with at least 1 positive culture, frozen section with >5PMN/HPF, intraoperative culture (>1/3 of cultures positive)	0.23|0.89	2.01|0.87	WEAK	POOR

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Yuan,K., 2015	Moderate Quality	74	serum WBC(10.5 x 10^9/L)	The final diagnosis of PJI required two of the following three criteria to be met: At least one positive culture on solidmedium grown from intra-operative specimens; purulence surrounding the prosthesis observed at the time of debridement or removal of the prosthesis; acute inflammation consistent with infection present during histopathologic examination	0.64|0.54	1.40|0.66	POOR	POOR

Table 49: serum polynuclear neutrophil count- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Bernard,L,2004	Low Quality	228	serum Polynuclear neutrophil count (6000 cells/ml)	Intraoperative cultures	0.54|0.81	2.84|0.57	WEAK	POOR

Figure 40: Meta-Analysis ROC Curve – Serum White Blood Cell Count: thresholds ranging from 6.2*10^9/L to 11.0x10^9/L (1 knee, 3 hips and 3 hip/knee studies)

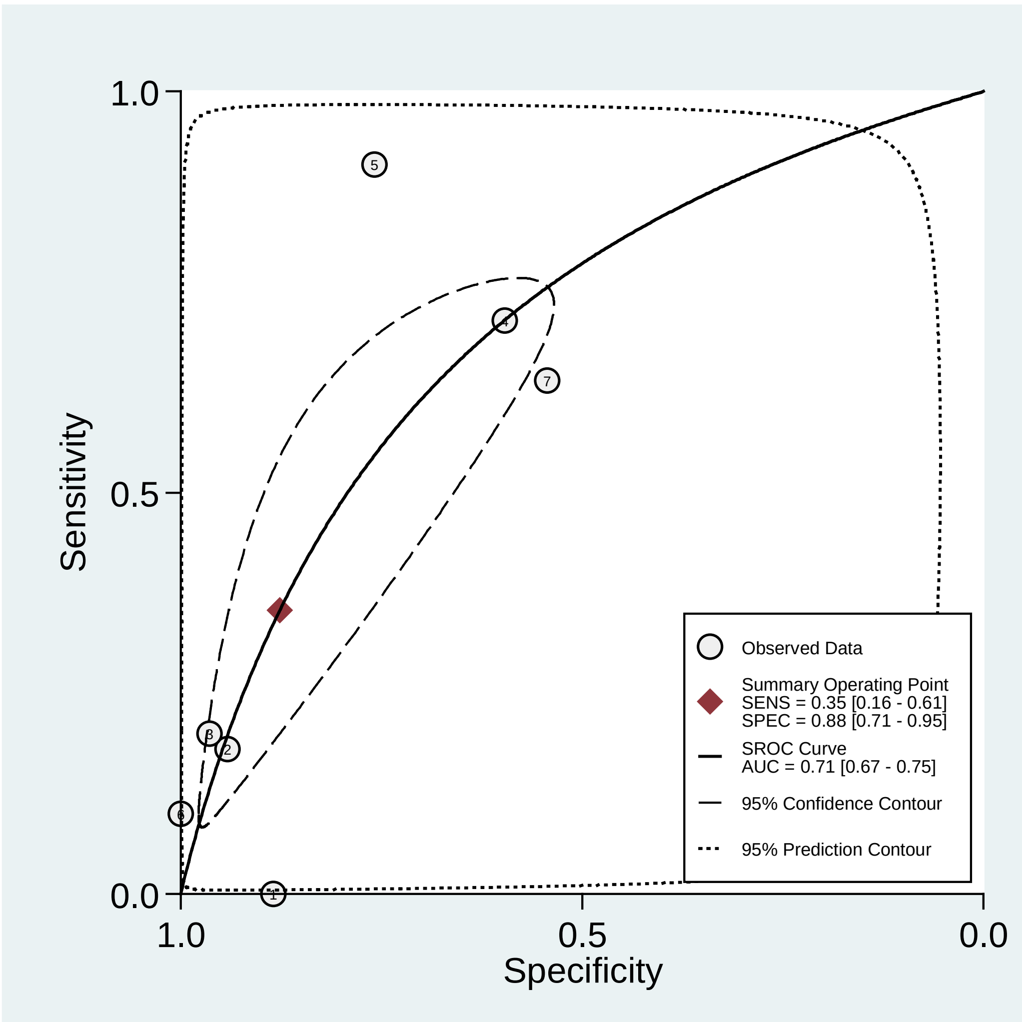


Table 50: meta-analysis statistics: Serum White Blood Cell Count: thresholds ranging from 6.2*10^9/L to 11.0x10^9/L (1 knee, 3 hips and 3 hip/knee studies)

Log likelihood = -40.161697 Number of studies = 7

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	-.6023526	.5281526			-1.637513	.4328074
E(logitSp)	1.958876	.5346172			.9110455	3.006706
Var(logitSe)	1.626922	1.083044			.4412865	5.998086
Var(logitSp)	1.727877	1.084173			.5051471	5.910273
Corr(logits)	-1	.			.	.
HSROC						
Lambda	1.318127	.3251822			.6807815	1.955472
Theta	-1.27055	.5200815			-2.289891	-.2512095
beta	.0301018	.2053428	0.15	0.883	-.3723626	.4325662
s2alpha	0	.			.	.
s2theta	1.676639	1.02846			.5038576	5.579195
Summary pt.						
Se	.3538056	.12075			.1628038	.6065439
Sp	.8764112	.0579068			.7132141	.9528762
DOR	3.882671	.9237071			2.435709	6.189218
LR+	2.862766	.6286621			1.861497	4.402601
LR-	.7373186	.0963138			.5707754	.9524565
1/LR-	1.356266	.177165			1.049917	1.752003

Covariance between estimates of E(logitSe) & E(logitSp) -.2540809

Evidence Summary: other serum tests

Evidence Summary: IL-6

One moderate quality hip study (Buttaro 2010) and two moderate quality hip/knee studies(Bottner 2007;Elgeidi 2014) evaluated serum IL-6. The Buttaro hip study evaluated a threshold of 10pg/ml, and the two studies of both hip and knee patients evaluated thresholds of 10.4pg/ml and 12pg/ml.
IL-6 was a moderately strong rule in test in all three studies (positive LR range=7.03 to 9.67). That is, a positive test result produces a moderately strong increase in probability of PJI. There was more variation in study results for the ability of IL-6 to rule out PJI. The two studies that looked at both hip and knee patients had strong negative likelihood ratios, ranging from 0 to .05. The study evaluating only hip patients produced a negative likelihood ratio of .67, which indicates a poor rule out test. Due to the small number of studies, the cause of heterogeneity cannot adequately be investigated, so we cannot say for sure if the cause of inconsistency if related to the patient population studied or other factors.

Evidence Summary: Serum CRP + IL-6

One moderate hip study(Buttaro 2010) evaluated the combination of CRP and IL-6. The test was positive if both CRP was 10mg/L and IL-6 was 10pg/ml. This combination was a very good rule in test(positive LR=54.55), in that a positive test meant a large increase in probability of PJI. However, this combination was a weak rule out test(negative LR=.45), meaning a negative result produced a small(but sometimes important) decrease in probability of PJI. There were no studies that evaluated the effect of a positive test result on only one of the two tests. Also, no studies evaluated this combination in knee patients.

Evidence Summary: Serum procalcitonin

One moderate quality hip(Yuan 2015) and one moderate quality hip/knee study(Bottner 2007) evaluated serum procalcitonin. The Bottner hip/knee study used a threshold of .3ng/ml, and found it to be a strong rule in test(positive LR=19) with a positive test causing a large increase in probability of PJI. However, the test was a poor rule out test(negative LR=.68), with a very small decrease in probability of PJI with a negative test. Yuan used a threshold of .05ng/ml in hip patients, and found a small but sometimes important change in probability of PJI for positive and negative tests(positive LR=3.07, negative LR=.27). It is unclear if the difference between the two studies, particularly in the strength of the positive LR, is the result of different patient populations (e.g. hip/knee or hip only) or the use of different test positivity thresholds.

Evidence Summary: TNF-Alpha

One moderate quality hip/knee study(Bottner 2007) evaluated the diagnostic accuracy of serum TNF-alpha of 40ng/ml. A positive test resulted in a moderate increase in probability of PJI(positive LR=8.14). However, it was a poor rule out test(negative LR=.6), meaning a negative test result caused only a small and rarely important decrease in probability of PJI.

Table 51: Summary of Findings- other serum tests

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	serum CRP + IL-6(both positive)(10 mg/L, 10 pg/ml)	1M	54.55-54.55	0.45-0.45	0.55-0.55	1-1
	serum IL-6 (10.4pg/ml)	1M	9.67-9.67	0-0	1-1	0.9-0.9
	serum IL-6(10pg/ml)	1M	7.03-7.03	0.67-0.67	0.36-0.36	0.95-0.95
	serum IL-6(12pg/ml)	1M	7.76-7.76	0.05-0.05	0.95-0.95	0.88-0.88
	serum TNF-alpha(40 ng/ml)	1M	8.14-8.14	0.6-0.6	0.43-0.43	0.95-0.95
	serum procalcitonin(.05 ng/mL)	1M	3.07-3.07	0.27-0.27	0.8-0.8	0.74-0.74
	serum procalcitonin(.3 ng/ml)	1M	19-19	0.68-0.68	0.33-0.33	0.98-0.98
Hip/Knee	serum IL-6 (10.4pg/ml)	1M	9.67-9.67	0-0	1-1	0.9-0.9
	serum IL-6(12pg/ml)	1M	7.76-7.76	0.05-0.05	0.95-0.95	0.88-0.88
	serum TNF-alpha(40 ng/ml)	1M	8.14-8.14	0.6-0.6	0.43-0.43	0.95-0.95
	serum procalcitonin(.3 ng/ml)	1M	19-19	0.68-0.68	0.33-0.33	0.98-0.98
Hip	serum CRP + IL-6(both positive)(10 mg/L, 10 pg/ml)	1M	54.55-54.55	0.45-0.45	0.55-0.55	1-1
	serum IL-6(10pg/ml)	1M	7.03-7.03	0.67-0.67	0.36-0.36	0.95-0.95
	serum procalcitonin(.05 ng/mL)	1M	3.07-3.07	0.27-0.27	0.8-0.8	0.74-0.74

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 52: serum IL-6- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Abou El-Khier,N.T., 2013	Moderate Quality	40	serum IL-6(10.4 pg/ml)	intraoperative tissue samples	1.00|0.90	9.67|0.00	**MODERATE**	**STRONG**
Bottner,F., 2007	Moderate Quality	78	serum IL-6(12 pg/ml)	Intraoperative cultures and histology	0.95|0.88	7.76|0.05	**MODERATE**	**STRONG**
Elgeidi,A., 2014	Moderate Quality	40	serum IL-6 (pg/mL)(10.4)	purulence, sinus tract, 2 positive intra-op cultures or 1 positive culture for virulent microorganism	1.00|0.90	9.67|0.00	**MODERATE**	**STRONG**

Table 53: serum IL-6- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Buttaro,M.A., 2010	Moderate Quality	69	serum IL-6(10 pg/L)	positive histology or culture	0.36|0.95	7.03|0.67	**MODERATE**	POOR

Table 54: serum IL-6 + serum CRP- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Buttaro,M.A., 2010	Moderate Quality	69	serum CRP+ IL-6(10 mg/L, 10 pg/L)	positive histology or culture	0.55|1.00	54.55|0.45	**STRONG**	WEAK

Table 55: serum TNF-alpha- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Bottner,F., 2007	Moderate Quality	78	serum TNF-alpha(40 ng/ml)	Intraoperative cultures and histology	0.43|0.95	8.14|0.60	**MODERATE**	POOR

Table 56: serum procalcitonin- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Bottner,F., 2007	Moderate Quality	78	serum procalcitonin(.3 ng/ml)	Intraoperative cultures and histology	0.33|0.98	19.00|0.68	**STRONG**	POOR

Table 57: serum procalcitonin- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Yuan,K., 2015	Moderate Quality	74	serum Procalcitonin(.05 ng/mL)	The final diagnosis of PJI required two of the following three criteria to be met: At least one positive culture on solidmedium grown from intra-operative specimens; purulence surrounding the prosthesis observed at the time of debridement or removal of the prosthesis; acute inflammation consistent with infection present during histopathologic examination	0.80|0.74	3.07|0.27	WEAK	WEAK

SYNOVIAL FLUID TESTS

Evidence Summary of Synovial Fluid Tests

Aspiration culture

There were two high, seven moderate and one low quality studies evaluating the diagnostic accuracy of preoperative aspiration culture(Della Valle 2007;Eisler 2001;Barrack 1993;Fink 2008;Fink 2013;Glithero 1993;Malhotra 2004;Mulcahy 1996;Williams 2004; Parvizi 2006). Every study evaluated preoperative synovial fluid, except the Parvizi 2006 study which used fluid obtained preoperatively. A meta-analysis of the preop aspiration studies found it to be a good rule in test(pooled positive LR=10.09(6.74,15.09)). Although slightly weaker as a rule out, the test was still useful(negative LR=.29(.22,.40)). The intra-op synovial fluid culture study found the test to be strong at ruling in, and moderately strong at ruling out PJI.

Intraoperative Synovial Fluid WBC and PMN%

There was one high, five moderate and four low quality studies evaluating synovial fluid WBC(Della Valle 2007;Cipriano 2012;Ghanem 2008;Trampuz 2004; Schinsky 2008;Spangehl 1999; Choi 2016;Higuera 2017; Chalmers 2015 ;Kwon 2016). Seven studies obtained synovial fluid preoperatively and three obtained fluid intraoperatively.
There was one high, five moderate and three low quality studies evaluating synovial fluid PMN% (Della Valle 2007;Cipriano 2012;Ghanem 2008; Schinsky 2008;Spangehl 1999; Trampuz 2004;Balato 2017;Higuera 2017;Kwon 2016). Seven studies used fluid obtained preoperatively and two used studies of intraoperative fluid
Most of the studies found both tests to be moderate to strong at ruling in and ruling out PJI.

One moderate quality study (Sousa 2017) evaluated synovial fluid WBC and %PMN combined with synovial fluid CRP and adenosine deaminase (ADA). PMN% + ADA was a strong rule in test (positive LR=20.87) and a weak rule out test (negative LR= .36). WBC + ADA also was a strong rule in test (positive LR=25.04) and weak rule out test(negative LR=.22). PMN% + CRP was a strong rule in test (positive LR=39.88) and a weak rule out test (negative LR= .4). WBC + CRP also was a strong rule in test (positive LR=77.42) and weak rule out test(negative LR=.23).

Synovial Fluid leukocyte esterase test

Three moderate quality studies evaluated the SF leukocyte esterase test (Koh 2017; Shafafy 2015; Parvizi 2011). Two studies use preoperative synovial fluid and one used intra-op synovial fluid. The test was useful for ruling in (positive LR range=4.25 to 80) and ruling out PJI(negative LR range= 0 to .2).

Synovial Fluid alpha defensin

Three moderate and three low quality studies evaluated the synovial fluid alpha-defensin(Kasparek 2016;Suda 2017; Bonanzinga 2017; Berger 2017;Deirmengian 2014; Bingham 2014). Three of the studies used fluid obtained intraoperatively, and the other three used fluid obtained preoperatively. The test was useful for ruling in (positive LR range=4.36 to 32.33) and ruling out PJI (.03 to .36).

Synovial Fluid CRP

One moderate and two low quality studies evaluated synovial fluid CRP using fluid obtained preoperatively(Tetreault 2014;Omar 2015;Vanderstappen 2013). One additional moderate quality study used intraoperative synovial fluid CRP in combination with fluid white blood cell count and %PMN. Fluid CRP alone was a moderate to strong rule in test and a moderate to strong rule out test. When used in combination with fluid WBC or PMN, it was very a strong rule in test, but a weaker rule out test(negative LR=.23 to.4)

Synovial Fluid PCR

One moderate knee (Melendez 2016) and one moderate hip/knee study (Morgenstern 2017) evaluated synovial fluid PCR using fluid obtained preoperatively. The test was moderately strong as a rule in test(positive LR range=5.55-6.82), and was of use for ruling out PJI(negative LR range=0.45-0.48).

Other Synovial Fluid Tests

The literature search uncovered single studies for synovial fluid IL-6, IL-8, alpha-2-Macroglobulin, and Vascular Endothelial Growth Factor(VGEF). However, the strength of evidence was not sufficient for recommendations to be made for or against these tests.

Table 58: Summary of Findings synovial fluid culture

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	Pre-Op Aspiration culture(not image guided)	1H/3M	12.47-31.32	0.11-0.29	0.73-0.89	0.94-0.97
	Pre-Op Aspiration culture(image guided)	1H/4M	2.16-17.72	0.34-0.94	0-0.69	0.88-0.96
	Pre-Op Aspiration culture(all studies)	2H/7M	10.03(6.5,15.5)	0.11-0.94	0-0.89	0.93(0.90,0.95)
	Pre-Op Aspiration culture(all studies except Eisler)	1H/7M	10.09(6.74,15.09)	.29(.22,.40)	.73(.64,.80)	.93(.90,.95)
	Intra-Op Aspiration culture	1L	27.8-27.8	0.11-0.11	0.9-0.9	0.97-0.97
Knee	Pre-Op Aspiration culture	1H/1M	14.22-15.23	0.21-0.29	0.73-0.8	0.94-0.95
	Intra-Op Aspiration culture	1L	27.8-27.8	0.11-0.11	0.9-0.9	0.97-0.97
Hip/Knee	Pre-Op Aspiration culture(not image guided)	1M	31.32-31.32	0.11-0.11	0.89-0.89	0.97-0.97
Hip	Pre-Op Aspiration culture(not image guided)	1M	12.47-12.47	0.21-0.21	0.8-0.8	0.94-0.94
	Pre-Op Aspiration culture(image guided)	1H/4M	2.16-17.72	0.34-0.94	0-0.69	0.88-0.96
	Pre-Op Aspiration culture(all studies)	1H/5M	7.9(4.7,13.3)	0.21-0.94	0-0.8	0.92(0.88,0.95)
	Pre-Op Aspiration culture(all hip studies except Eisler)	4M	7.64(5.03,11.61)	0.21-0.61	.67(.55,.78)	.91(.88,.94)

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 59: preoperative synovial fluid aspiration culture- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Fink,B,2008	Moderate Quality	145	Aspiration culture	Intraoperative Cultures and Histology	0.73|0.95	15.23|0.29	**STRONG**	WEAK
Della,Valle,CJ,2007	High Quality	94	Aspiration culture on solid media	At least 2 of 3 positive intraoperative cultures on solid media or 2 of following: 1)at least 1 positive culture 2)final histopathology consistent with infection 3)gross purulence at revision	0.8|0.94	14.22|0.21	**STRONG**	WEAK

Table 60: intraoperative synovial fluid culture- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Parvizi,J,2006	Low Quality	70	Intraoperative Fluid Culture	At least 3 of: 1)CRP >1mg/dL 2)ESR >30mm/hr 3)positive joint aspiration culture 4)purulent intraoperative tissue appearance 5)positive intraoperative culture	0.9|0.97	27.8|0.11	**STRONG**	**MODERATE**

Table 61: preoperative synovial fluid aspiration culture- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Glithero,PR,1993	Moderate Quality	54	Aspiration culture	Intraoperative Cultures	0.89|0.97	31.32|0.11	**STRONG**	**MODERATE**

Table 62: preoperative synovial fluid aspiration culture- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Barrack,RL,1993	Moderate Quality	260	Aspiration culture (initial)(under fluroscopic control)	Correlation between intraoperative cultures and histology; the appearance of the tissue intraoperatively; and the clinical course	0.5|0.88	4|0.57	WEAK	POOR
Barrack,RL,1993	Moderate Quality	291	Aspiration culture (under fluroscopic control)	Correlation between intraoperative cultures and histology; the appearance of the tissue intraoperatively; and the clinical course	0.6|0.88	5.11|0.45	**MODERATE**	WEAK
Barrack,RL,1993	Moderate Quality	31	Aspiration (repeat)(under fluroscopic control)	Correlation between intraoperative cultures and histology; the appearance of the tissue intraoperatively; and the clinical course	0.67|0.96	16.67|0.35	**STRONG**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Eisler,T,2001	High Quality	57	Ultrasound Guided Aspiration culture	Intraoperative Cultures	0|0.96	2.16|0.94	WEAK	POOR
Fink,B., 2013	Moderate Quality	100	Aspiration culture. under image intensifier control. 10 ml saline used if no fluid was obtained(2 positive samples)	intraoperative samples	0.64|0.96	17.72|0.37	**STRONG**	WEAK
Malhotra,R,2004	Moderate Quality	41	Aspiration culture (done in conjunction with flurocopically guided biopsy)	Histology	0.44|0.91	4.74|0.61	WEAK	POOR
Mulcahy,DM,1996	Moderate Quality	71	Aspiration culture(fluroscopic guided)	Intraoperative Cultures and Histology	0.69|0.91	7.56|0.34	**MODERATE**	WEAK
Williams,JL,2004	Moderate Quality	273	Aspiration culture	Intraoperative Cultures	0.8|0.94	12.47|0.21	**STRONG**	WEAK

Figure 41: Meta-Analysis ROC Curve- Preoperative Aspiration Culture (1 hip/knee, 6 hip, 2 knee studies)

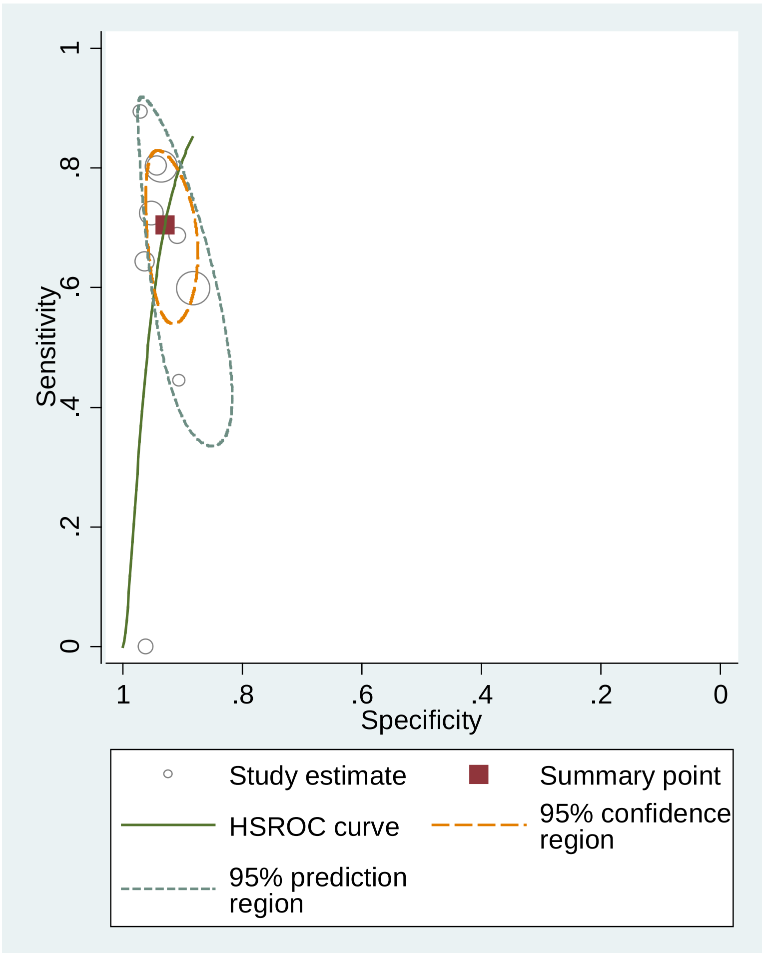


Table 63: meta-analysis statistics: Preoperative Aspiration Culture (1 hip/knee, 6 hip, 2 knee studies)

Log likelihood = -43.7245 Number of studies = 9

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	.871397	.2313438			.4179715	1.324822
E(logitSp)	2.581874	.2071875			2.175794	2.987954
Var(logitSe)	.2024281	.257057			.0168018	2.438847
Var(logitSp)	.0812105	.0947413			.0082526	.7991636
Corr(logits)	.9572187	.9733295			-1	1
HSROC						
Lambda	3.937648	.9129725			2.148255	5.727041
Theta	-1.275316	.7521684			-2.749539	.1989066
beta	-.4566702	.7681341	-0.59	0.552	-1.962185	1.048845
s2alpha	.5018926	.4763376			.0781178	3.224567
s2theta	.0027426	.0631189			7.06e-23	1.07e+17
Summary pt.						
Se	.7050363	.0481103			.6029978	.7899829
Sp	.9296858	.0135439			.8980546	.9520269
DOR	31.60359	11.23841			15.74144	63.4495
LR+	10.02695	2.241818			6.469306	15.54103
LR-	.3172724	.0533767			.2281548	.4411996
1/LR-	3.151865	.5302573			2.266548	4.382989

Covariance between estimates of E(logitSe) & E(logitSp) .0150043

Figure 42: Meta-Analysis Forest Plot- Preoperative Aspiration Culture (1 hip/knee, 6 hip, 2 knee studies)

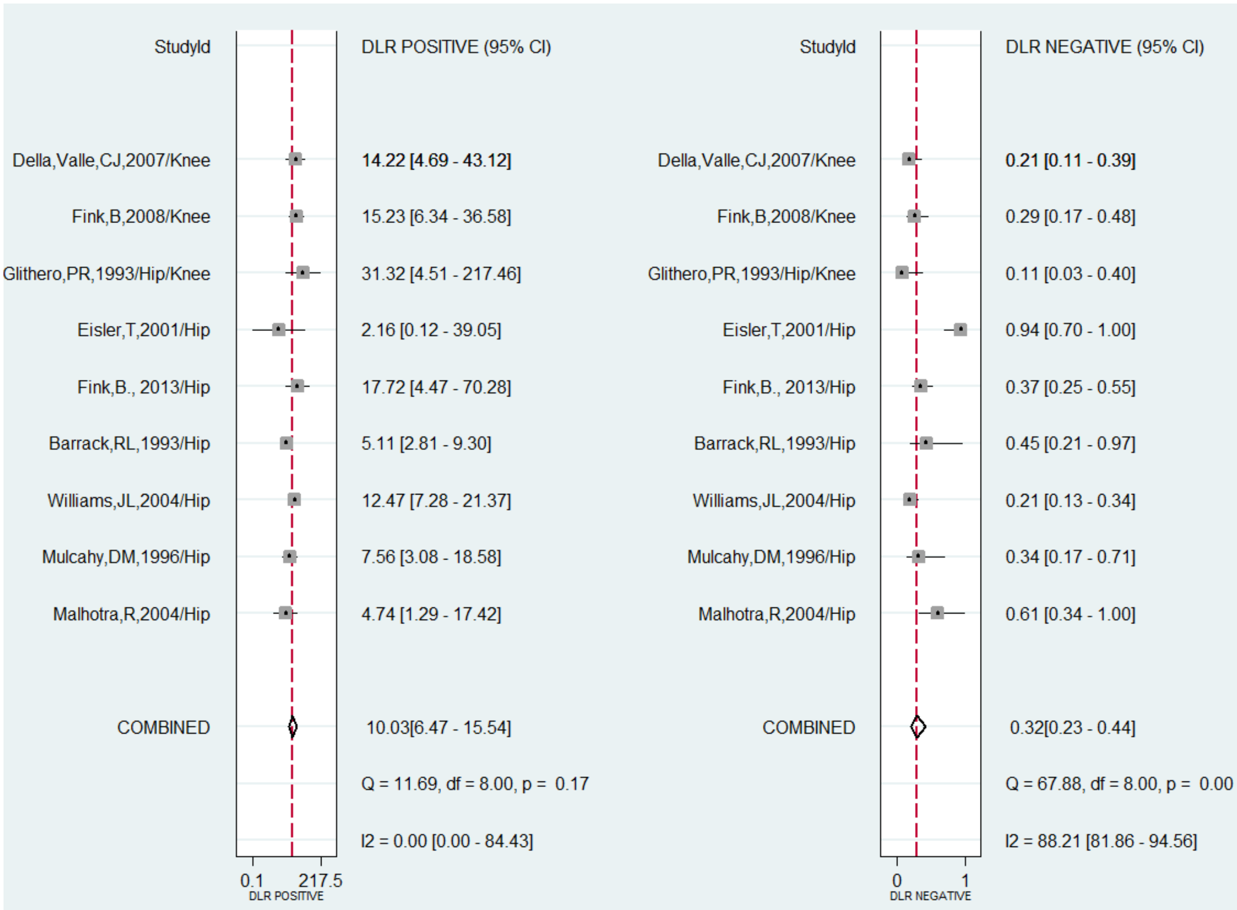


Figure 43: Meta-Analysis ROC Curve- Preoperative Aspiration Culture (6 hip studies)

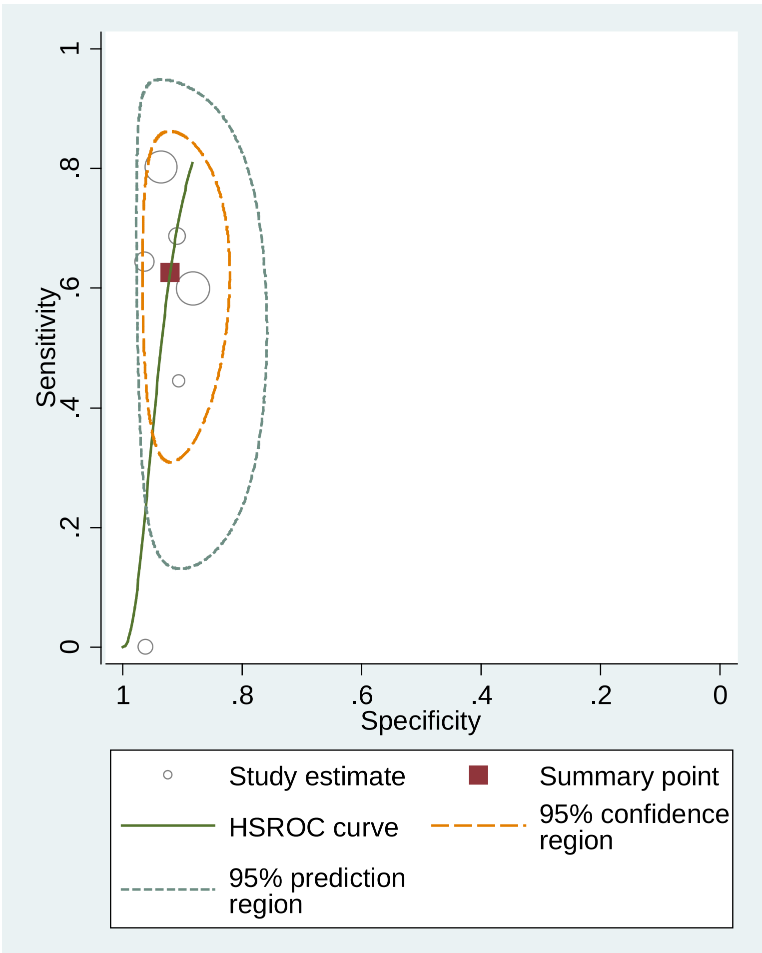


Table 64: meta-analysis statistics: Preoperative Aspiration Culture (6 hip studies)

Log likelihood = -29.895137   Number of studies = 6

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	.5153927	.354428			-.1792734	1.210059
E(logitSp)	2.449694	.2489308			1.961799	2.937589
Var(logitSe)	.2921547	.4209591			.0173434	4.921417
Var(logitSp)	.0603453	.1059622			.0019319	1.884928
Corr(logits)	.2765514	1.517397			-.9943858	.9981934
HSROC						
Lambda	3.981195	1.532332			.9778808	6.98451
Theta	-1.643145	1.011411			-3.625473	.3391838
beta	-.7886	1.019251	-0.77	0.439	-2.786295	1.209095
s2alpha	.3389975	.3827725			.0370748	3.099662
s2theta	.0480293	.1433052			.0001386	16.64335
Summary pt.						
Se	.6260698	.0829739			.4553013	.7703094
Sp	.9205391	.0182085			.8767275	.9496736
DOR	19.39638	8.442743			8.264467	45.52257
LR+	7.878964	2.095284			4.67849	13.26883
LR-	.4062079	.0905787			.2623869	.6288607
1/LR-	2.461794	.5489458			1.590177	3.811165

Covariance between estimates of E(logitSe) & E(logitSp)   .0009389

Figure 44: Meta-Analysis Forest Plot- Preoperative Aspiration Culture-Excluding Eisler (1 hip/knee, 5 hip, 2 knee studies)

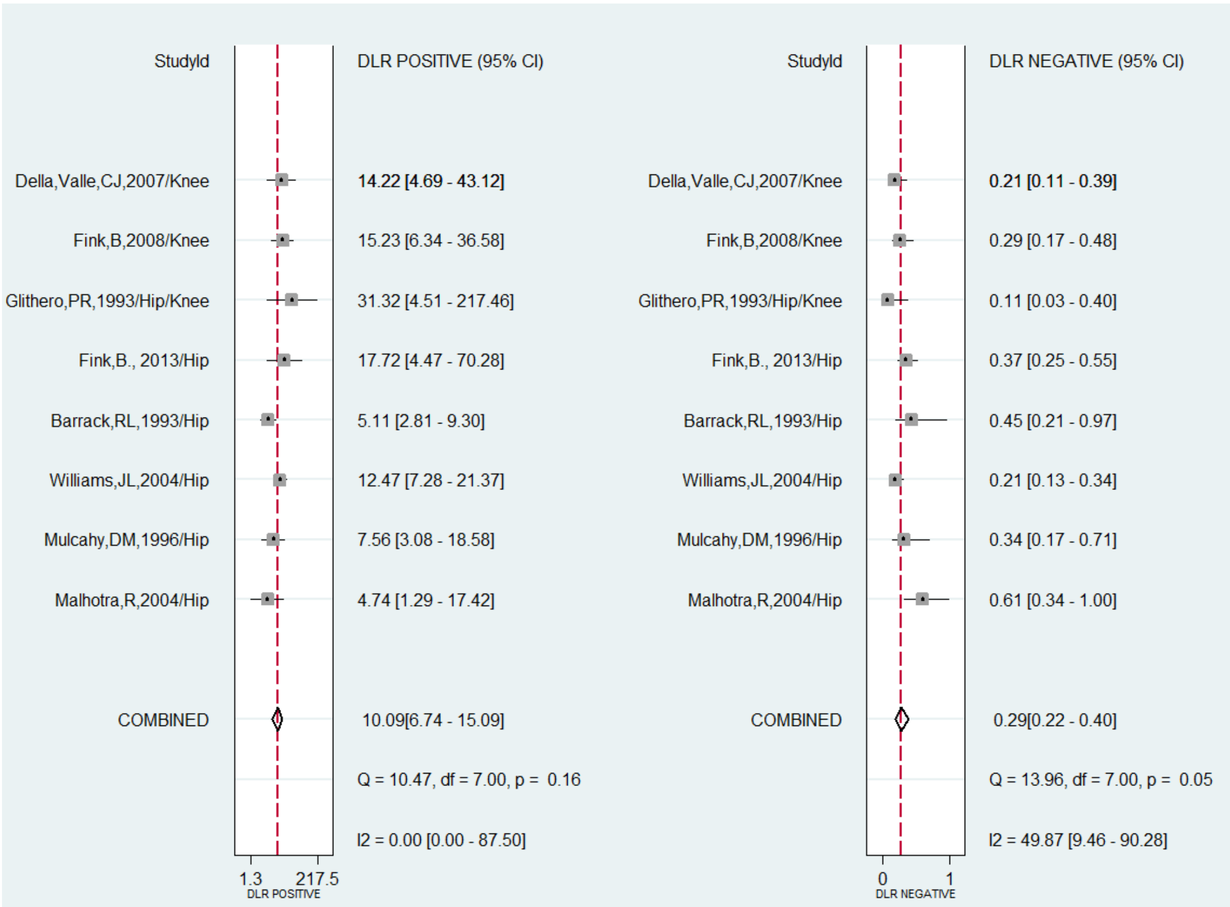


Figure 45: Meta-Analysis Forest Plot- Preoperative Aspiration Culture (6 hip studies)

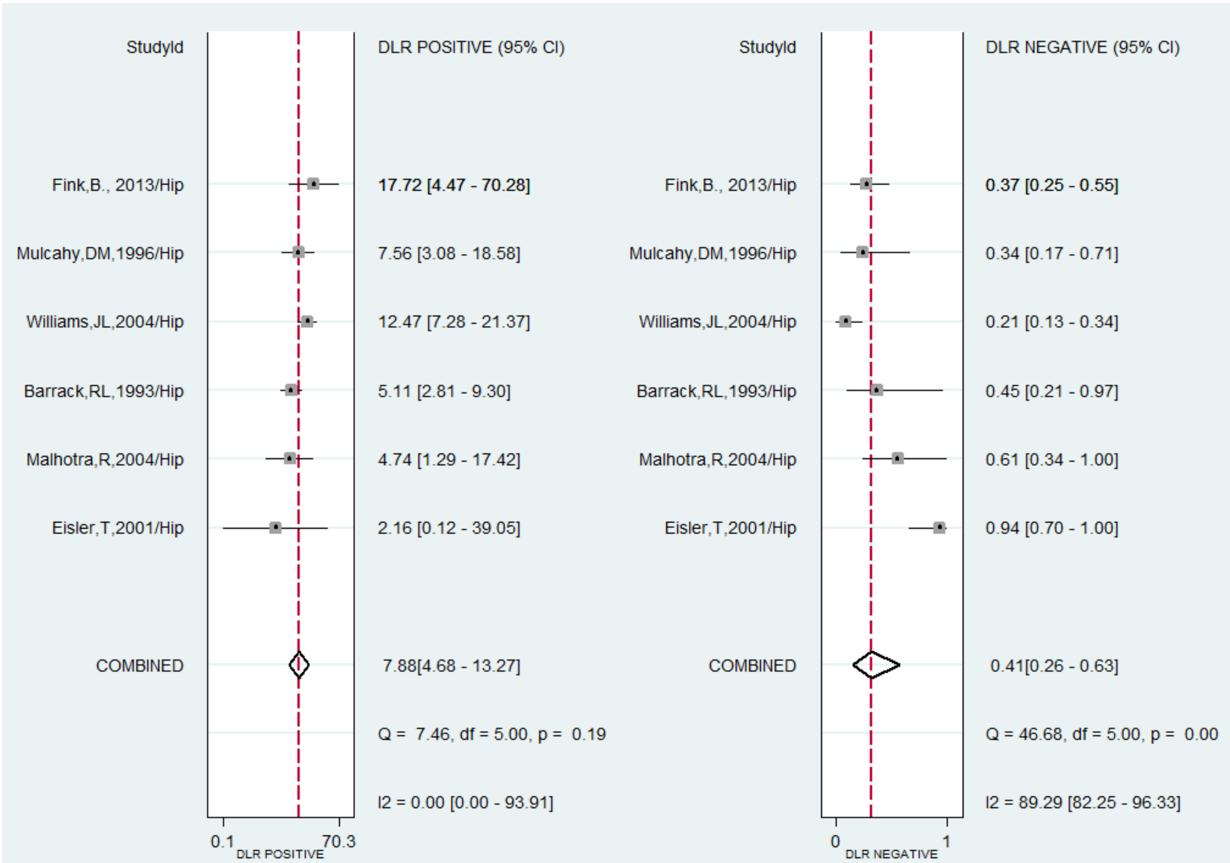


Figure 46: Meta-Analysis Forest Plot- Preoperative Aspiration Culture- Excluding Eisler Study (5 hip studies)

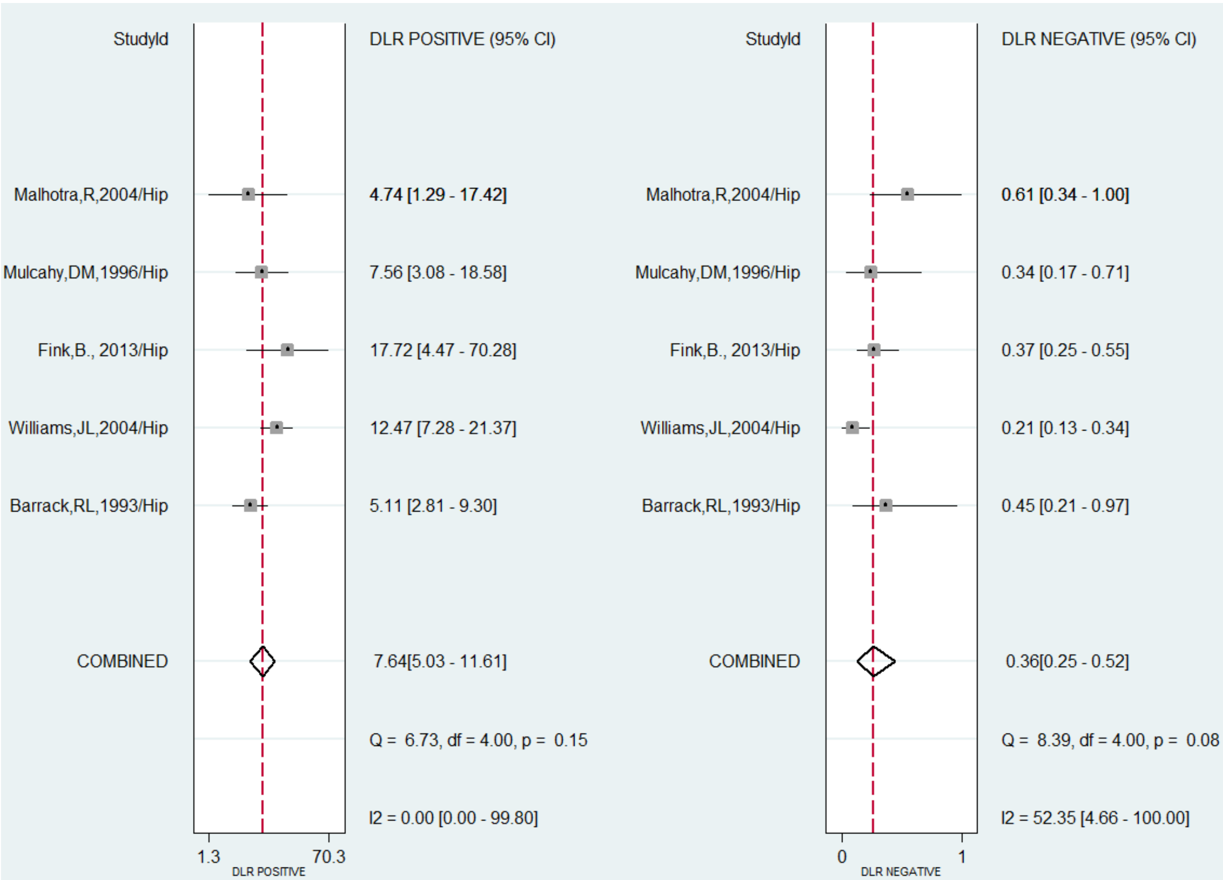


Table 65: Summary of Findings preoperative- synovial fluid WBC

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	Synovial Percentage Mononuclears in patients with dual taper modular implants with taper corrosion (0.02)	1L	1.1-1.1	0-0	1-1	0.09-0.09
	synovial fluid PMN% in inflammatory arthritis patients.(0.75)	1M	5.25-5.25	0-0	1-1	0.81-0.81
	synovial fluid PMN% in patients with dual taper modular implants with taper corrosion(0.65)	1L	3.29-3.29	0-0	1-1	0.7-0.7
	synovial fluid PMN%(0.64)	1M	18.19-18.19	0.05-0.05	0.95-0.95	0.95-0.95
	synovial fluid PMN%(0.65)	1H/1M	6.46-48.04	0.03-0.03	0.97-0.98	0.85-0.98
	synovial fluid PMN%(0.76)	1L	5-5	0-0	1-1	0.8-0.8
	synovial fluid PMN%(0.78)	1M	7.44-7.44	0.05-0.05	0.95-0.95	0.87-0.87
	synovial fluid PMN%(0.8)	2L	6.5-16.29	0.09-0.17	0.84-0.92	0.86-0.95
	synovial fluid PMN%(0.82)	1L	4.73-4.73	0.11-0.11	0.91-0.91	0.81-0.81
	synovial fluid PMN%(0.95)	1L	4.88-4.88	0.3-0.3	0.75-0.75	0.85-0.85
	synovial fluid WBC (1100 cells/microL)	2M	7.59-7.76	0.07-0.11	0.91-0.94	0.88-0.88
	synovial fluid WBC (1290 cells/microL)	1L	5.42-5.42	0.2-0.2	0.83-0.83	0.85-0.85
	synovial fluid WBC (1556 cells/microL)	1L	17.64-17.64	0.1-0.1	0.91-0.91	0.95-0.95
	synovial fluid WBC (1714 cells/microL)	1L	5.32-5.32	0.21-0.21	0.82-0.82	0.85-0.85
	synovial fluid WBC (2689 cells/microL)	1L	13.19-13.19	0.09-0.09	0.92-0.92	0.93-0.93
	synovial fluid WBC (3000 cells/microL)	1H	35.57-35.57	0.01-0.01	1-1	0.98-0.98
	synovial fluid WBC (3450 cells/microL)	1M	13.15-13.15	0.1-0.1	0.91-0.91	0.93-0.93
	synovial fluid WBC (3966 cells/microL)	1L	10.19-10.19	0.11-0.11	0.9-0.9	0.91-0.91
	synovial fluid WBC (5750 cells/microL)	1L	94.12-94.12	0.06-0.06	0.94-0.94	1-1
	synovial fluid WBC (6878 cells/microL)	1L	7.78-7.78	0.36-0.36	0.67-0.67	0.91-0.91
	synovial fluid WBC count in patients with inflammatory arthritis(3444 cells/microL)	1M	4.7-4.7	0.13-0.13	0.89-0.89	0.81-0.81
	synovial fluid WBC in patients with dual taper modular implants with taper corrosion (730 cells/microL)	1L	4.29-4.29	0.18-0.18	0.86-0.86	0.8-0.8
	synovial fluid absolute neutrophil count(1001 cells/microL)	1L	2.92-2.92	0-0	1-1	0.66-0.66

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
	synovial fluid absolute neutrophil count(1499 cells/microL)	1L	7.09-7.09	0.21-0.21	0.82-0.82	0.88-0.88
	synovial fluid absolute neutrophil count(2146 cells/microL)	1L	11.4-11.4	0.1-0.1	0.91-0.91	0.92-0.92
	synovial fluid absolute neutrophil count(408 cells/microL)	1L	4.64-4.64	0.2-0.2	0.83-0.83	0.82-0.82
Knee	synovial fluid PMN%(0.64)	1M	18.19-18.19	0.05-0.05	0.95-0.95	0.95-0.95
	synovial fluid PMN%(0.65)	1H/1M	6.46-48.04	0.03-0.03	0.97-0.98	0.85-0.98
	synovial fluid PMN%(0.8)	1L	16.29-16.29	0.17-0.17	0.84-0.84	0.95-0.95
	synovial fluid WBC (1100 cells/microL)	2M	7.59-7.76	0.07-0.11	0.91-0.94	0.88-0.88
	synovial fluid WBC (3000 cells/microL)	1H	35.57-35.57	0.01-0.01	1-1	0.98-0.98
Hip/Knee	synovial fluid PMN% in inflammatory arthritis patients.(0.75)	1M	5.25-5.25	0-0	1-1	0.81-0.81
	synovial fluid PMN%(0.78)	1M	7.44-7.44	0.05-0.05	0.95-0.95	0.87-0.87
	synovial fluid WBC (3450 cells/microL)	1M	13.15-13.15	0.1-0.1	0.91-0.91	0.93-0.93
	synovial fluid WBC count in patients with inflammatory arthritis(3444 cells/microL)	1M	4.7-4.7	0.13-0.13	0.89-0.89	0.81-0.81
Hip	Synovial Percentage Mononuclears in patients with dual taper modular implants with taper corrosion (0.02)	1L	1.1-1.1	0-0	1-1	0.09-0.09
	synovial fluid PMN% in patients with dual taper modular implants with taper corrosion(0.65)	1L	3.29-3.29	0-0	1-1	0.7-0.7
	synovial fluid PMN%(0.76)	1L	5-5	0-0	1-1	0.8-0.8
	synovial fluid PMN%(0.8)	1L	6.5-6.5	0.09-0.09	0.92-0.92	0.86-0.86
	synovial fluid PMN%(0.82)	1L	4.73-4.73	0.11-0.11	0.91-0.91	0.81-0.81
	synovial fluid PMN%(0.95)	1L	4.88-4.88	0.3-0.3	0.75-0.75	0.85-0.85
	synovial fluid WBC (1290 cells/microL)	1L	5.42-5.42	0.2-0.2	0.83-0.83	0.85-0.85
	synovial fluid WBC (1556 cells/microL)	1L	17.64-17.64	0.1-0.1	0.91-0.91	0.95-0.95
	synovial fluid WBC (1714 cells/microL)	1L	5.32-5.32	0.21-0.21	0.82-0.82	0.85-0.85
	synovial fluid WBC (2689 cells/microL)	1L	13.19-13.19	0.09-0.09	0.92-0.92	0.93-0.93
	synovial fluid WBC (3966 cells/microL)	1L	10.19-10.19	0.11-0.11	0.9-0.9	0.91-0.91
	synovial fluid WBC (5750 cells/microL)	1L	94.12-94.12	0.06-0.06	0.94-0.94	1-1
	synovial fluid WBC (6878 cells/microL)	1L	7.78-7.78	0.36-0.36	0.67-0.67	0.91-0.91
	synovial fluid WBC in patients with dual taper modular implants with taper corrosion (730 cells/microL)	1L	4.29-4.29	0.18-0.18	0.86-0.86	0.8-0.8
	synovial fluid absolute neutrophil count(1001 cells/microL)	1L	2.92-2.92	0-0	1-1	0.66-0.66

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
	synovial fluid absolute neutrophil count(1499 cells/microL)	1L	7.09-7.09	0.21-0.21	0.82-0.82	0.88-0.88
	synovial fluid absolute neutrophil count(2146 cells/microL)	1L	11.4-11.4	0.1-0.1	0.91-0.91	0.92-0.92
	synovial fluid absolute neutrophil count(408 cells/microL)	1L	4.64-4.64	0.2-0.2	0.83-0.83	0.82-0.82

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 66: Summary of Findings intraoperative- synovial fluid WBC

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	intraop synovial fluid >80% Neutrophils(0.8)	1M	5.94-5.94	0.13-0.13	0.89-0.89	0.85-0.85
	intraop synovial fluid >80% PMN(0.8)	1M	4.78-4.78	0.22-0.22	0.82-0.82	0.83-0.83
	intraop synovial fluid >80% PMN, among patients with elevated ESR and CRP(0.8)	1M	8.78-8.78	0.14-0.14	0.88-0.88	0.9-0.9
	intraop synovial fluid WBC among patients with either elevated ESR or CRP(3.0x10^3 cells/microleter)	1M	6.43-6.43	0.19-0.19	0.83-0.83	0.87-0.87
	intraop synovial fluid WBC among patients with either elevated ESR or CRP(9.0x10^3 cells/microleter)	1M	86.4-86.4	0.22-0.22	0.83-0.83	1-1
	intraop synovial fluid WBC among patients with elevated ESR and CRP(3.0x10^3 cells/microleter)	1M	8.98-8.98	0.11-0.11	0.9-0.9	0.9-0.9
	intraop synovial fluid WBC among patients with elevated ESR and CRP(9.0x10^3 cells/microleter)	1M	8.16-8.16	0.2-0.2	0.82-0.82	0.9-0.9
	intraop synovial fluid WBC(4.2x10^3 cells/microleter)	1M	12.21-12.21	0.18-0.18	0.84-0.84	0.93-0.93
	intraop synovial fluid WBC(4.45x10^3 cells/microleter)	1L	102.73-102.73	0.1-0.1	0.9-0.9	0.99-0.99
	intraop synovial fluid WBC(5.0x10^4 cells/microleter)	1M	55.36-55.36	0.65-0.65	0.36-0.36	0.99-0.99
	intraoperative synovial fluid WBC and %PMN(both positive)(Leucocyte count 1463 cells/uL , PMN 81%)	1M	3.13-3.13	0.29-0.29	0.78-0.78	0.75-0.75
	synovial fluid segmented cell count(47 cells/microliter)	1M	14.54-14.54	0.12-0.12	0.89-0.89	0.94-0.94
Knee	intraop synovial fluid WBC(4.45*10^3 cells/microleter)	1L	102.73-102.73	0.1-0.1	0.9-0.9	0.99-0.99
	synovial fluid segmented cell count(47 cells/microliter)	1M	14.54-14.54	0.12-0.12	0.89-0.89	0.94-0.94
Hip/Knee	intraoperative synovial fluid WBC and %PMN(both positive)(Leucocyte count 1463 cells/uL , PMN 81%)	1M	3.13-3.13	0.29-0.29	0.78-0.78	0.75-0.75
Hip	intraop synovial fluid >80% Neutrophils(0.8)	1M	5.94-5.94	0.13-0.13	0.89-0.89	0.85-0.85
	intraop synovial fluid >80% PMN(0.8)	1M	4.78-4.78	0.22-0.22	0.82-0.82	0.83-0.83
	intraop synovial fluid >80% PMN, among patients with elevated ESR and CRP(0.8)	1M	8.78-8.78	0.14-0.14	0.88-0.88	0.9-0.9
	intraop synovial fluid WBC among patients with either elevated ESR or CRP(3.0x10^3 cells/microleter)	1M	6.43-6.43	0.19-0.19	0.83-0.83	0.87-0.87
	intraop synovial fluid WBC among patients with either elevated ESR or CRP(9.0x10^3 cells/microleter)	1M	86.4-86.4	0.22-0.22	0.83-0.83	1-1
	intraop synovial fluid WBC among patients with elevated ESR and CRP(3.0x10^3 cells/microleter)	1M	8.98-8.98	0.11-0.11	0.9-0.9	0.9-0.9
	intraop synovial fluid WBC among patients with elevated ESR and CRP(9.0x10^3 cells/microleter)	1M	8.16-8.16	0.2-0.2	0.82-0.82	0.9-0.9
	intraop synovial fluid WBC(4.2x10^3 cells/microleter)	1M	12.21-12.21	0.18-0.18	0.84-0.84	0.93-0.93
	intraop synovial fluid WBC(5.0x10^4 cells/microleter)	1M	55.36-55.36	0.65-0.65	0.36-0.36	0.99-0.99

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 67: preoperative - synovial fluid WBC- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Ghanem,E,2008	Moderate Quality	429	synovial fluid WBC (1.1x10^3 /microliter)	at least 1 of 3 criteria: 1)presence of an abscess or sinus tract communicating with the joint space 2)positive culture of aspirate on solid medium 3)2 positive intraoperative cultures of the same organism, or one positive culture on solid medium and the presence of gross intracapsular purulence or abnormal histological findings; when cultures were negative, infection was present if had both grossly purulent fluid and an abnormal frozen section (Mirra et al. criteria)	0.91|0.88	7.59|0.11	**MODERATE**	**MODERATE**
Trampuz,A,2004	Moderate Quality	133	synovial fluid WBC (1.7x10^3 /microliter)	at least 1 of the following criteria: growth of the same microorganism in at least 2 cultures of synovial fluid or periprosthetic tissue; visible synovial fluid purulence at the time of arthrocentesis or during surgery; acute inflammation on histopathologic examination of permanent periprosthetic tissue sections; or presence of a sinus tract communicating with the prosthesis	0.94|0.88	7.76|0.07	**MODERATE**	**STRONG**

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Della,Valle,CJ,2007	High Quality	94	synovial fluid WBC (3.0x10^3/?L)	At least 2 of 3 positive intraoperative cultures on solid media or 2 of following: 1)at least 1 positive culture 2)final histopathology consistent with infection 3)gross purulence at revision	1|0.98	35.57|0.01	**STRONG**	**STRONG**

Table 68: preoperative - synovial fluid WBC- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Cipriano,C.A., 2012	Moderate Quality	61	synovial WBC count in patients with inflammatory arthritis(3444/mL)	two positive cultures of specimens from the joint, or 2/3 of criteria: the presence of a sinus tract or gross purulence at the time of revision, one positive deep culture, or histopathological findings consistent with infection with a mean of more than ten polymorphonuclear cells in the five most cellular fields examined	0.89|0.81	4.70|0.13	WEAK	**MODERATE**
Cipriano,C.A., 2012	Moderate Quality	810	Synovial fluid WBC count in patients with noninflammatory arthritis(3450/mL)	two positive cultures of specimens from the joint, or 2/3 of criteria: the presence of a sinus tract or gross purulence at the time of revision, one positive deep culture, or histopathological findings consistent with infection with a mean of more than ten polymorphonuclear cells in the five most cellular fields examined	0.91|0.93	13.15|0.10	**STRONG**	**STRONG**

Table 69: preoperative - synovial fluid WBC- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Choi,H.R., 2016	Low Quality	138	synovial fluid white blood cell count(some with ultrasound guidance and some without)(2689 cell/microL)	composite; MSIS and ICMPJI criteria	0.92|0.93	13.19|0.09	**STRONG**	**STRONG**
Choi,H.R., 2016	Low Quality	28	synovial fluid white blood cell count(some with ultrasound guidance and some without)(5750 cell/microL)	composite; MSIS and ICMPJI criteria	0.94|1.00	94.12|0.06	**STRONG**	**STRONG**
Choi,H.R., 2016	Low Quality	110	synovial fluid WBC (synovial fluid white blood cell count(with or without ultrasound guidance)(1556 cell/microL)	composite; MSIS and ICMPJI criteria	0.91|0.95	17.64|0.10	**STRONG**	**STRONG**
Higuera,C.A., 2017	Low Quality	453	synovial fluid white blood cell count(3966)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.90|0.91	10.19|0.11	**STRONG**	**MODERATE**
Higuera,C.A., 2017	Low Quality	37	synovial fluid white blood cell count(1714)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.82|0.85	5.32|0.21	**MODERATE**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Higuera,C.A., 2017	Low Quality	51	synovial fluid white blood cell count(1290)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.83|0.85	5.42|0.20	**MODERATE**	**MODERATE**
Higuera,C.A., 2017	Low Quality	38	synovial fluid white blood cell count(6878)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.67|0.91	7.78|0.36	**MODERATE**	WEAK
Kwon,Y.M., 2016	Low Quality	62	Synovial White Blood Cell Count(730 cells/uL (optimal cutoff))	MSIS criteria	0.857142|0.8	4.285714|0.178571	WEAK	**MODERATE**

Table 70: preoperative - synovial fluid mononuclear percentage- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Kwon,Y.M., 2016	Low Quality	62	Synovial Percentage Mononuclears (%MONO) Count(2 (optimal cutoff))	MSIS criteria	1|0.090909	1.1|0	POOR	**STRONG**

Table 71: preoperative - synovial fluid neutrophil count- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Higuera,C.A., 2017	Low Quality	415	synovial fluid absolute neutrophil count(2146)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.91|0.92	11.40|0.10	**STRONG**	**MODERATE**
Higuera,C.A., 2017	Low Quality	37	synovial fluid absolute neutrophil count(1499)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.82|0.88	7.09|0.21	**MODERATE**	WEAK
Higuera,C.A., 2017	Low Quality	51	synovial fluid absolute neutrophil count(408)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.83|0.82	4.64|0.20	WEAK	WEAK
Higuera,C.A., 2017	Low Quality	38	synovial fluid absolute neutrophil count(1001)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	1.00|0.66	2.92|0.00	WEAK	**STRONG**

Table 72: preoperative - synovial fluid neutrophil percentage- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Balato,G., 2017	Low Quality	167	Synovial Fluid %PMN(80%)	International Consensus Meeting criteria	0.84|0.95	16.29|0.17	**STRONG**	**MODERATE**
Ghanem,E,2008	Moderate Quality	429	synovial fluid > 64% Neutrophils	at least 1 of 3 criteria: 1)presence of an abscess or sinus tract communicating with the joint space 2)positive culture of aspirate on solid medium 3)2 positive intraoperative cultures of the same organism, or one positive culture on solid medium and the presence of gross intracapsular purulence or abnormal histological findings; when cultures were negative, infection was present if had both grossly purulent fluid and an abnormal frozen section (Mirra et al. criteria)	0.95|0.95	18.19|0.05	**STRONG**	**STRONG**
Trampuz,A,2004	Moderate Quality	133	synovial fluid > 65% Neutrophils	at least 1 of the following criteria: growth of the same microorganism in at least 2 cultures of synovial fluid or periprosthetic tissue; visible synovial fluid purulence at the time of arthrocentesis or during surgery; acute inflammation on histopathologic examination of permanent periprosthetic tissue sections; or presence of a sinus tract communicating with the prosthesis	0.97|0.98	48.04|0.03	**STRONG**	**STRONG**

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Della,Valle,CJ,2007	High Quality	94	synovial fluid >65% PMN	At least 2 of 3 positive intraoperative cultures on solid media or 2 of following: 1)at least 1 positive culture 2)final histopathology consistent with infection 3)gross purulence at revision	0.98|0.85	6.46|0.03	**MODERATE**	**STRONG**

Table 73: preoperative - synovial fluid neutrophil percentage- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Cipriano,C.A., 2012	Moderate Quality	61	Synovial fluid PMN% in inflammatory arthritis patients.(75%)	two positive cultures of specimens from the joint, or 2/3 of criteria: the presence of a sinus tract or gross purulence at the time of revision, one positive deep culture, or histopathological findings consistent with infection with a mean of more than ten polymorphonuclear cells in the five most cellular fields examined	1.00|0.81	5.25|0.00	**MODERATE**	**STRONG**
Cipriano,C.A., 2012	Moderate Quality	810	Synovial fluid PMN % in noninflammatory arthritis patients(78%)	two positive cultures of specimens from the joint, or 2/3 of criteria: the presence of a sinus tract or gross purulence at the time of revision, one positive deep culture, or histopathological findings consistent with infection with a mean of more than ten polymorphonuclear cells in the five most cellular fields examined	0.95|0.87	7.44|0.05	**MODERATE**	**STRONG**

Table 74: preoperative - synovial fluid neutrophil percentage- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Higuera,C.A., 2017	Low Quality	415	synovial fluid PMN%(80%)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.92|0.86	6.50|0.09	**MODERATE**	**STRONG**
Higuera,C.A., 2017	Low Quality	37	synovial fluid PMN%(82%)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.91|0.81	4.73|0.11	WEAK	**MODERATE**
Higuera,C.A., 2017	Low Quality	51	synovial fluid PMN%(95%)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	0.75|0.85	4.88|0.30	WEAK	WEAK
Higuera,C.A., 2017	Low Quality	38	synovial fluid PMN%(76%)	MSIS criteria. for evaluation of WBC and PMN as index tests, these individual tests were removed from diagnostic criteria to avoid incorporatoin bias.	1.00|0.80	5.00|0.00	**MODERATE**	**STRONG**
Kwon,Y.M., 2016	Low Quality	62	Synovial Percentage Polymorphonuclear (%PMN)(65 (optimal cutoff))	MSIS criteria	1|0.696428	3.294117|0	WEAK	**STRONG**

Table 75: intraoperative- synovial fluid WBC- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Chalmers,P.N., 2015	Low Quality	433	synovial fluid White cell blood count(quality would be low for this test, because index test is part of reference standard)(4450)	bacterial growth from aspirate cultures, the presence of a sinus tract, intraoperative purulence, or a combination of at least three of four laboratory values (abnormal ESR, abnormal CRP, synovial fluid white blood-cell count of >3000 cells/mL, or abnormal intraoperative frozen section22)	0.90|0.99	102.73|0.10	**STRONG**	**STRONG**

Table 76: intraoperative - synovial fluid WBC- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Schinsky,MF,2008	Moderate Quality	201	intraop synovial fluid WBC(4.2x10^3/microleter)	At least 2 of: 1)a positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	0.84|0.93	12.21|0.18	**STRONG**	**MODERATE**
Schinsky,MF,2008	Moderate Quality	79	intraop synovial fluid WBC(3.0x10^3/microleter), among patients with elevated ESR and CRP	At least 2 of: 1)a positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	0.9|0.9	8.98|0.11	**MODERATE**	**MODERATE**
Schinsky,MF,2008	Moderate Quality	79	synovial fluid WBC(9.0x10^3/microleter), among patients with elevated ESR and CRP	At least 2 of: 1)a positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	0.82|0.9	8.16|0.2	**MODERATE**	**MODERATE**
Schinsky,MF,2008	Moderate Quality	60	intraop synovial fluid WBC (3.0x10^3/microleter), among patients with elevated ESR or CRP, not both	At least 2 of: 1)a positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	0.83|0.87	6.43|0.19	**MODERATE**	**MODERATE**
Schinsky,MF,2008	Moderate Quality	60	synovial fluid WBC (9.0x10^3/microleter), among patients with elevated ESR or CRP, not both	At least 2 of: 1)a positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	0.83|1	86.4|0.22	**STRONG**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Spangehl,MJ,1999	Moderate Quality	183	intraop synovial fluid WBC (5.0x10^4/microleter)	at least 1 of: 1)open wound of sinus in communication with the joint 2)systemic infection with pain in the joint and purulent fluid within the joint 3)positive result on at least 3 investigations(ESR, CRP, preoperative aspiration, frozen section, intraoperative cultures	0.36|0.99	55.36|0.65	**STRONG**	POOR

Table 77: intraoperative - synovial fluid neutrophil percentage- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Schinsky,MF,2008	Moderate Quality	201	intraop synovial fluid >80% PMN	At least 2 of: 1)positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	0.82|0.83	4.78|0.22	WEAK	WEAK
Schinsky,MF,2008	Moderate Quality	79	intraop synovial fluid >80% PMN, among patients with elevated ESR and CRP	At least 2 of: 1)positive intraoperative culture (on solid media) 2)gross purulence 3)final histopathology	0.88|0.9	8.78|0.14	**MODERATE**	**MODERATE**
Spangehl,MJ,1999	Moderate Quality	181	intraop synovial fluid >80% Neutrophils	at least 1 of: 1)open wound of sinus in communication with the joint 2)systemic infection with pain in the joint and purulent fluid within the joint 3)positive result on at least 3 investigations (ESR, CRP, preoperative aspiration, frozen section, intraoperative cultures	0.89|0.85	5.94|0.13	**MODERATE**	**MODERATE**

Table 78: intraoperative - synovial fluid segmented cell count- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Chalmers,P.N., 2015	Moderate Quality	433	synovial fluid Segmented cell count(73)	bacterial growth from aspirate cultures, the presence of a sinus tract, intraoperative purulence, or a combination of at least three of four laboratory values (abnormal ESR, abnormal CRP, synovial fluid white blood-cell count of >3000 cells/mL, or abnormal intraoperative frozen section22)	0.89|0.94	14.54|0.12	**STRONG**	**MODERATE**

Figure 47: Meta-Analysis ROC Curve- preoperative percent neutrophils/ percent PMN (4 knee studies. cutoffs ranged from 64% to 80%)

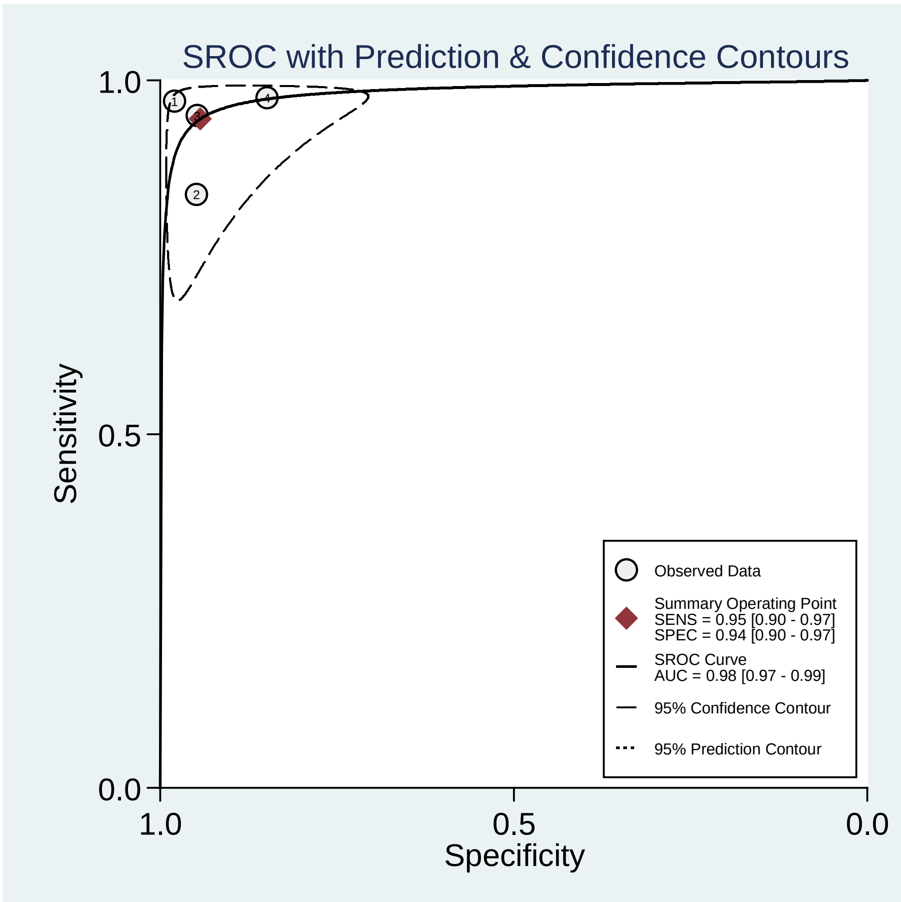


Table 79: meta-analysis statistics: preoperative %neutrophils/%PMN (4 knee studies. cutoffs ranged from 64% to 80%)

Log likelihood = -19.971578 Number of studies = 4

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	2.851608	.3335609			2.197841	3.505375
E(logitSp)	2.812618	.3145376			2.196135	3.4291
Var(logitSe)	.1139722	.4212628			.0000814	159.5883
Var(logitSp)	.2341867	.3324492			.0144946	3.783724
Corr(logits)	-1	.			.	.
HSROC						
Lambda	5.763334	1.072291			3.661683	7.864986
Theta	.5324678	2.907336			-5.165806	6.230742
beta	.3600821	2.045998	0.18	0.860	-3.650001	4.370165
s2alpha	0	.			.	.
s2theta	.1633731	.3122272			.0038585	6.917309
Summary pt.						
Se	.9454017	.0172175			.9000554	.9708403
Sp	.9433539	.0168081			.8999019	.9686017
DOR	288.3646	98.61193			147.5221	563.6727
LR+	16.68961	4.824755			9.470534	29.41154
LR-	.0578767	.0178171			.0316567	.1058138
1/LR-	17.2781	5.318972			9.450567	31.58885

Covariance between estimates of E(logitSe) & E(logitSp) -.0466268

Table 80: Summary of Findings synovial fluid CRP

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	synovial fluid CRP(1.8 mg/L)	1L	6.6-6.6	0-0	1-1	0.85-0.85
	synovial fluid CRP(2.5 mg/L)	1L	14.05-14.05	0.05-0.05	0.95-0.95	0.93-0.93
	synovial fluid CRP(2.8 mg/L)	1L	15-15	0.1-0.1	0.91-0.91	0.94-0.94
	synovial fluid CRP(6.6 mg/L)	1M	5.86-5.86	0.15-0.15	0.88-0.88	0.85-0.85
	synovial fluid CRP(8.5 mg/L)	1M	6.36-6.36	0.15-0.15	0.87-0.87	0.86-0.86
	synovial fluid CRP(14.1 mg/L)	1M	11.8-11.8	0.19-0.19	0.82-0.82	0.93-0.93
Knee	synovial fluid CRP(1.8 mg/L)	1L	6.6-6.6	0-0	1-1	0.85-0.85
	synovial fluid CRP(2.8 mg/L)	1L	15-15	0.1-0.1	0.91-0.91	0.94-0.94
	synovial fluid CRP(14.1 mg/L)	1M	11.8-11.8	0.19-0.19	0.82-0.82	0.93-0.93
Hip/Knee	synovial fluid CRP(6.6 mg/L)	1M	5.86-5.86	0.15-0.15	0.88-0.88	0.85-0.85
Hip	synovial fluid CRP(2.5 mg/L)	1L	14.05-14.05	0.05-0.05	0.95-0.95	0.93-0.93
	synovial fluid CRP(8.5 mg/L)	1M	6.36-6.36	0.15-0.15	0.87-0.87	0.86-0.86

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 81: synovial fluid CRP- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Tetreault,M.W., 2014	Moderate Quality	60	Synovial CRP collected preoperatively or in operating room at revision(14.1 mg/L)	MSIS criteria	0.82|0.93	11.80|0.19	**STRONG**	**MODERATE**
Vanderstappen,C., 2013	Low Quality	44	synovial fluid CRP(1.8 mg/L)	MSIS criteria	1.00|0.85	6.60|0.00	**MODERATE**	**STRONG**
Vanderstappen,C., 2013	Low Quality	44	synovial fluid CRP(2.8 mg/L)	MSIS criteria	0.91|0.94	15.00|0.10	**STRONG**	**STRONG**

Table 82: synovial fluid CRP- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Tetreault,M.W., 2014	Moderate Quality	119	Synovial CRP collected preoperatively or in operating room at revision(6.6 mg/L)	MSIS criteria	0.88|0.85	5.86|0.15	**MODERATE**	**MODERATE**

Table 83: synovial fluid CRP- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Omar,M., 2015	Low Quality	89	synovial C-reactive protein(2.5 mg/L)	sinus draining, purulence, microbiology, culture, serology and synovial findings	0.95|0.93	14.05|0.05	**STRONG**	**STRONG**
Tetreault,M.W., 2014	Moderate Quality	59	Synovial CRP collected preoperatively or in operating room at revision(8.5 mg/L)	MSIS criteria	0.87|0.86	6.36|0.15	**MODERATE**	**MODERATE**

Table 84: Summary of Findings - other preoperative synovial fluid tests

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	Synovasure lateral flow device alpha-defensin test on synovial fluid(synovasure test)	2L	16.77-28.15	0.03-0.03	0.97-1	0.95-0.97
	preop or intra-op aspiration tested with a-defensin 1-3 (5.2 mg/L)	1L	21.79-21.79	0.03-0.03	0.97-0.97	0.96-0.96
	synovial fluid Alpha-2-Macroglobulin(0.262 mg/mL)	1L	17.34-17.34	0.2-0.2	0.81-0.81	0.95-0.95
	synovial fluid Interleukin-6(4270 pg/mL)	1L	87.1-87.1	0.13-0.13	0.87-0.87	1-1
	synovial fluid Interleukin-8(8790 pg/mL)	1L	38.84-38.84	0.1-0.1	0.9-0.9	0.98-0.98
	synovial fluid PCR	1M/1L	5.55-6.82	0.45-0.48	0.56-0.6	0.89-0.92
	synovial fluid Vascular Endothelial Growth Factor(9745 pg/mL)	1L	8.32-8.32	0.25-0.25	0.77-0.77	0.91-0.91
	synovial fluid leukocyte esterase test(LE semi-quantitative reagent strips indicating 70 WBCs)	1M	6.39-6.39	0.16-0.16	0.86-0.86	0.87-0.87
	synovial fluid leukocyte esterase test(LE semi-quantitative reagent strips indicating 125 WBCs)	1M	11.52-11.52	0.2-0.2	0.82-0.82	0.93-0.93
	synovial fluid leukocyte esterase test(LE strip(double plus sign))	1M	4.67-4.67	0-0	1-1	0.79-0.79
	synovial fluid leukocyte esterase test(LE strip(single plus sign))	1M	4.25-4.25	0.19-0.19	0.85-0.85	0.8-0.8
Knee	synovial fluid PCR	1M	6.82-6.82	0.48-0.48	0.56-0.56	0.92-0.92
	synovial fluid leukocyte esterase test(LE strip(double plus sign))	1M	4.67-4.67	0-0	1-1	0.79-0.79
	synovial fluid leukocyte esterase test(LE strip(single plus sign))	1M	4.25-4.25	0.19-0.19	0.85-0.85	0.8-0.8
Hip/Knee	Synovasure lateral flow device alpha-defensin test on synovial fluid(synovasure test)	1L	28.15-28.15	0.03-0.03	0.97-0.97	0.97-0.97
	preop or intra-op aspiration tested with a-defensin 1-3 (5.2 mg/L)	1L	21.79-21.79	0.03-0.03	0.97-0.97	0.96-0.96
	synovial fluid Alpha-2-Macroglobulin(0.262 mg/mL)	1L	17.34-17.34	0.2-0.2	0.81-0.81	0.95-0.95
	synovial fluid Interleukin-6(4270 pg/mL)	1L	87.1-87.1	0.13-0.13	0.87-0.87	1-1
	synovial fluid Interleukin-8(8790 pg/mL)	1L	38.84-38.84	0.1-0.1	0.9-0.9	0.98-0.98
	synovial fluid PCR	1L	5.55-5.55	0.45-0.45	0.6-0.6	0.89-0.89
	synovial fluid Vascular Endothelial Growth Factor(9745 pg/mL)	1L	8.32-8.32	0.25-0.25	0.77-0.77	0.91-0.91
	synovial fluid leukocyte esterase test(LE semi-quantitative reagent strips indicating 70 WBCs)	1M	6.39-6.39	0.16-0.16	0.86-0.86	0.87-0.87
	synovial fluid leukocyte esterase test(LE semi-quantitative reagent strips indicating 125 WBCs)	1M	11.52-11.52	0.2-0.2	0.82-0.82	0.93-0.93

* study quality key: H=High, M=Moderate, L=Low

range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 85: Summary of Findings - other intraoperative synovial fluid tests

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	synovial fluid alpha defensin(synovasure test)	3M	4.36-32.33	0.03-0.36	0.67-0.97	0.82-0.97
	synovial fluid leukocyte esterase test double positive signs(double plus sign)	1M	80-80	0.2-0.2	0.8-0.8	1-1
	synovial fluid leukocyte esterase test single positive sign(single plus sign)	1M	7.28-7.28	0.08-0.08	0.93-0.93	0.87-0.87
Knee	synovial fluid leukocyte esterase test double positive signs(double plus sign)	1M	80-80	0.2-0.2	0.8-0.8	1-1
	synovial fluid leukocyte esterase test single positive sign(single plus sign)	1M	7.28-7.28	0.08-0.08	0.93-0.93	0.87-0.87
Hip/Knee	synovial fluid alpha defensin(synovasure test)	2M	4.36-9.33	0.28-0.36	0.67-0.77	0.82-0.93

Table 86: preoperative synovial fluid alpha-defensin- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Bingham J,. 2014	Low Quality	61	Alpha Defensin-1 Biomarker Assay	MSIS criteria	1|0.95	16.77|0.03	STRONG	STRONG
Berger,P., 2017	Low Quality	121	Synovasure lateral flow device alpha-defensin test on synovial fluid(positive when the control line and the alpha defensin visible)	modified MSIS criteria, excluding histology	0.97|0.97	28.15|0.03	STRONG	STRONG
Deirmengian,C., 2014	Low Quality	149	preop or intra-op aspiration tested with a-defensin 1-3 (HNP1-3)(5.2 mg/L)(measured using enzyme-linked immunosorbent assay (ELISA))	MSIS criteria	0.97|0.96	21.79|0.03	**STRONG**	**STRONG**

Table 87: intraoperative synovial fluid alpha-defensin- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Kasparek,M.F., 2016	Moderate Quality	40	Synovasure Test(presence of control and alpha defensin band)		0.67|0.93	9.33|0.36	**MODERATE**	WEAK
Suda,A.J., 2017	Moderate Quality	30	Alpha defensin Synovasure rapid test()	MSIS criteria	0.77|0.82	4.36|0.28	WEAK	WEAK
Bonanzinga, T,. 2017	Moderate Quality	156	Alpha Defensin Immunoassay test	International Consensus Group Criteria	0.97|0.97	32.33|0.03	**STRONG**	**STRONG**

Table 88: preoperative synovial fluid leukocyte esterase- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Koh,I.J., 2017	Moderate Quality	60	Synovial Fluid Leukocyte Esterase Strip(double plus sign)	MSIS criteria	1.00|0.79	4.67|0.00	WEAK	**STRONG**
Koh,I.J., 2017	Moderate Quality	60	Synovial Fluid Leukocyte Esterase Strip(single plus sign)	MSIS criteria	0.85|0.80	4.25|0.19	WEAK	**MODERATE**

Table 89: preoperative synovial fluid leukocyte esterase- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Shafafy,R., 2015	Moderate Quality	103	synovial fluid leukocyte esterase semi-quantitative strip test(70 WBC)	Infectious Diseases Society of America (IDSA) criteria	0.86|0.87	6.39|0.16	**MODERATE**	**MODERATE**
Shafafy,R., 2015	Moderate Quality	103	synovial fluid leukocyte esterase semi-quantitative strip test(125 WBC)	Infectious Diseases Society of America (IDSA) criteria	.82|.93	11.52|.2	**STRONG**	**MODERATE**

Table 90: intraoperative synovial fluid leukocyte esterase- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Parvizi,J., 2011	Moderate Quality	108	synovial fluid leukocyte esterase test double positive signs(dark purple)()	sinus tract or open wound communication with joint, Purulence, intraoperative fluid or tissue cultures, elevated serum marker levels as well as elevated WBC and/or cell count differential	0.80|1.00	80.00|0.20	**STRONG**	**MODERATE**
Parvizi,J., 2011	Moderate Quality	108	synovial fluid leukocyte esterase test double positive signs(dark purple) or single positive sign(light purple)()	sinus tract or open wound communication with joint, Purulence, intraoperative fluid or tissue cultures, elevated serum marker levels as well as elevated WBC and/or cell count differential	0.93|0.87	7.28|0.08	**MODERATE**	**STRONG**

Table 91: synovial fluid PCR- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Melendez,D.P., 2016	Moderate Quality	284	synovial fluid Genus and Group Specific multi-assay panel PCR(targeting Staphylococcus species, Enterococcus/Granulicatella/Abiotrophia species, Proteus species, Enterobacteriaceae, Bacteroides fragilis group, Pseudomonas aeruginosa, streptococci, Corynebacterium species, Propionibacterium/ Actinomyces species, and anaerobic Gram-positive cocci)	MSIS criteria	0.56|0.92	6.82|0.48	**MODERATE**	WEAK

Table 92: synovial fluid PCR- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Morgenstern,C., 2017	Low Quality	142	Synovial Fluid multiplex PCR device()	European Bone and Joint Infection Society (EBJIS) criteria	0.60|0.89	5.55|0.45	**MODERATE**	WEAK

Table 93: synovial fluid Alpha-2-Macroglobulin- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Jacovides,C.L., 2011	Low Quality	74	synovial fluid Alpha-2-Macroglobulin(0.262 mg/mL)	they presented with a sinus tract or open wound in communication with the joint or purulence was encountered in the joint intraoperatively, (2) preoperative or intraoperative fluid or tissue cultures were positive, or (3) a combination of positive serologic and aspiration analyses	0.81|0.95	17.34|0.20	**STRONG**	WEAK

Table 94: synovial fluid IL-6- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Jacovides,C.L., 2011	Low Quality	74	synovial fluid Interleukin-6(4270 pg/mL)	they presented with a sinus tract or open wound in communication with the joint or purulence was encountered in the joint intraoperatively, (2) preoperative or intraoperative fluid or tissue cultures were positive, or (3) a combination of positive serologic and aspiration analyses	0.87|1.00	87.10|0.13	**STRONG**	**MODERATE**

Table 95: synovial fluid IL-8- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Jacovides,C.L., 2011	Low Quality	75	synovial fluid Interleukin-8(8790 pg/mL)	they presented with a sinus tract or open wound in communication with the joint or purulence was encountered in the joint intraoperatively, (2) preoperative or intraoperative fluid or tissue cultures were positive, or (3) a combination of positive serologic and aspiration analyses	0.90|0.98	38.84|0.10	**STRONG**	**STRONG**

Table 96: synovial fluid VEGF- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Jacovides,C.L., 2011	Low Quality	74	synovial fluid Vascular Endothelial Growth Factor(9745 pg/mL)	they presented with a sinus tract or open wound in communication with the joint or purulence was encountered in the joint intraoperatively, (2) preoperative or intraoperative fluid or tissue cultures were positive, or (3) a combination of positive serologic and aspiration analyses	0.77|0.91	8.32|0.25	**MODERATE**	WEAK

INTRAOPERATIVE TESTS SECTION

Quality Evaluation Table 5- intraoperative diagnostic tests

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Abdul-Karim,F.W., 1998	●	●	◑	◑	◑	●	Include	Moderate Quality
Aggarwal,V.K., 2013	●	●	●	●	●	◑	Include	High Quality
Alijanipour,P., 2013	●	◑	●	●	●	◑	Include	Moderate Quality
Athanasou,N.A., 1995	●	◑	●	◑	◑	◑	Include	Low Quality
Atkins,B.L., 1998	●	●	●	●	◑	◑	Include	Moderate Quality
Banit,D.M., 2002	●	●	●	●	◑	◑	Include	Moderate Quality
Boettner,F., 2016	●	●	◑	●	●	◑	Include	Moderate Quality
Bonanzinga,T. 2017	●	●	●	◑	●	○	Include	Moderate Quality
Buttaro,M.A., 2010	●	◑	●	◑	●	●	Include	Moderate Quality
Chalmers,P.N., 2015	●	●	○	●	◑	●	Include	Moderate Quality

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Chimento,G.F., 1996	●	●	○	●	◐	●	Include	Moderate Quality
Cazanave,C., 2017	●	●	◐	◐	◐	◐	Include	Low Quality
El,Espera,I, 2004	●	◐	●	◐	●	●	Include	Moderate Quality
Elgeidi,A., 2014	●	●	●	○	◐	●	Include	Moderate Quality
Fink,B., 2013	●	◐	●	◐	●	●	Include	Moderate Quality
Frances,Borrego A., 2007	●	●	●	◐	●	○	Include	Moderate Quality
Gomez,E., 2012	●	◐	●	◐	◐	○	Include	Low Quality
Greenwood-Quaintance,K.E., 2014	●	◐	●	●	●	●	Include	High Quality
Janz,V., 2013	●	◐	●	●	◐	◐	Include	Moderate Quality
Kasparek,M.F., 2016	●	●	●	●	○	●	Include	Moderate Quality
Nunez,L.V., 2007	●	◐	●	●	◐	●	Include	Moderate Quality
Parvizi,J., 2011	●	◐	●	◐	●	●	Include	Moderate Quality

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Pelosi,E., 2004	●	●	●	●	●	●	Include	High Quality
Pons,M., 1999	●	◑	●	◑	◑	●	Include	Moderate Quality
Schafer,P., 2008	●	●	●	◑	◑	●	Include	Moderate Quality
Smith,E.B., 2014	●	●	●	●	◑	●	Include	High Quality
Sousa,R., 2017	●	●	◑	●	◑	●	Include	Moderate Quality
Spangehl,M.J., 1999	●	●	◑	◑	◑	●	Include	Moderate Quality
Suda,A.J., 2017	●	◑	●	●	◑	●	Include	Moderate Quality
Teller,R.E., 2000	●	◑	●	●	◑	●	Include	Moderate Quality
Tetreault,M.W., 2014	●	●	●	●	◑	◑	Include	Moderate Quality
Trampuz, A., 2007	●	◑	●	●	◑	●	Include	Moderate Quality
Vicente,A.G., 2004	●	◑	●	●	●	●	Include	High Quality

Evidence Summary: Intraoperative cultures

Overall, there were seven studies that evaluated the effect of intraoperative tissue cultures (Aggarwal 2013;Atkins 1998;Schafer 2008;Spangehl 1999;Trampuz 2006;Trampuz 2007;Parvizi 2006). There was 1 high, 5 moderate and 1 low quality study included. Five studies examined combined hip and knee patient populations (Aggarwal 2013;Atkins 1998;Schafer 2008;Trampuz 2006;Trampuz 2007), whereas Spangehl(1999) evaluated only hip patients, and Parvizi 2006 evaluated only knee patients. Positivity thresholds ranged from 1 to 3 positive samples.

The Summary of Findings for intraoperative cultures can be found in Table 1. Five studies were meta-analyzed at a threshold of 2 or more positive samples indicating PJI (Figure 2). The analysis revealed that two positive cultures was a very good rule in test, with a positive likelihood ratio(LR) of 28.9, meaning that a positive test produces a large increase in probability of PJI. However, this was a weak rule out test with a negative LR of .34., meaning that a negative test produced a small but sometimes important decrease in probability of infection. One moderate quality study that evaluated three positive tissue samples using different reference standards showed positive likelihood ratios ranging from 114 to 168, and negative likelihood ratios ranging from .3 to .38, again indicating it is a very strong rule in test, and a weak rule out test.

Six studies evaluated thresholds of one positive sample, but due to very high statistical heterogeneity, the data were not meta-analyzed. In the studies, the positive likelihood ratios ranged from 2.87 to 40.6, and the negative likelihood ratios ranged from .06 to .29. This indicates that only one positive sample may be a weaker rule in test and slightly stronger rule out test than multiple positive samples.

One low quality study looked at intraoperative fluid cultures in knee patients (Parvizi 2006). This was a strong rule in test (positive LR=27.8), and a moderate rule out test (negative LR=.11).

Two studies (one high and one moderate quality) evaluated intraoperative swab cultures (Aggarwal 2013;Spangehl 1999). One study was in hip patients, and the other in both hip and knee patients. At a threshold of 1 positive swab culture the positive likelihood ratio ranged from 6.09 to 115, indicating a moderate to strong rule in test. The negative likelihood ratio ranged from .24 to .34, indicating a weak rule out test. Aggarwal et al 2013 also studied a threshold of two positive samples. This was a stronger rule in test (positive LR=23), but a weaker rule out test (negative LR=.48).

One high quality knee study by Smith et al 2014, looked at broth-only tissue and/or fluid cultures. This study found that broth-only cultures of tissue and/or fluid was a poor rule in test (positive LR=1.55) and poor rule out test (negative LR=.92). However, Suda et al. (moderate quality) looked at combined tissue and fluid samples (not limited to broth only) in hip and knee patients, which showed them to be a strong rule in (positive LR=15.23) and a moderate rule out test.

Table 97: Summary of Findings intraoperative cultures

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	Intraoperative Fluid Culture(undefined)	1L	27.8-27.8	0.11-0.11	0.9-0.9	0.97-0.97
	Intraoperative Swab Cultures (1 or more positive)	1H/1M	6.09-115	0.24-0.34	0.7-0.76	0.89-0.99
	Intraoperative Swab Cultures (2 or more positive)	1H	23.2-23.2	0.48-0.48	0.53-0.53	0.98-0.98
	Intraoperative Tissue Cultures (undefined)	1L	53.6-53.6	0.17-0.17	0.85-0.85	1-1
	Intraoperative Tissue Cultures(1 or more positive)	1H/5M	2.87-40.6	0.06-0.29	0.73-0.94	0.67-0.98
	Intraoperative Tissue Cultures(2 or more positive)	1H/4M	28.9(14.3, 58.6)	0.34(0.27, 0.43)	0.54-0.77	0.93-0.99
	Intraoperative Tissue Cultures(3 or more positive)	1M	114-168	0.3-0.38	0.62-0.7	0.99-1
	Intraoperative tissue and fluid culture (undefined)	1H/1M	1.55-15.23	0.16-0.92	0.19-0.85	0.88-0.94
Knee	Intraoperative Fluid Culture(undefined)	1L	27.8-27.8	0.11-0.11	0.9-0.9	0.97-0.97
	Intraoperative Tissue Cultures (undefined)	1L	53.6-53.6	0.17-0.17	0.85-0.85	1-1
	Intraoperative tissue and fluid culture (undefined)	1H	1.55-1.55	0.92-0.92	0.19-0.19	0.88-0.88
Hip/Knee	Intraoperative Swab Cultures (1 or more positive)	1H	6.09-6.09	0.34-0.34	0.7-0.7	0.89-0.89
	Intraoperative Swab Cultures (2 or more positive)	1H	23.2-23.2	0.48-0.48	0.53-0.53	0.98-0.98
	Intraoperative Tissue Cultures(1 or more positive)	1H/4M	2.87-40.6	0.07-0.29	0.73-0.94	0.67-0.98
	Intraoperative Tissue Cultures(2 or more positive)	1H/4M	11.54-76.6	0.25-0.47	0.54-0.77	0.93-0.99
	Intraoperative Tissue Cultures(3 or more positive)	1M	114-168	0.3-0.38	0.62-0.7	0.99-1
	Intraoperative tissue and fluid culture (undefined)	1M	15.23-15.23	0.16-0.16	0.85-0.85	0.94-0.94
Hip	Intraoperative Swab Cultures (1 or more positive)	1M	115-115	0.24-0.24	0.76-0.76	0.99-0.99
	Intraoperative Tissue Cultures(1 or more positive)	1M	30.6-30.6	0.06-0.06	0.94-0.94	0.97-0.97

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 98: intraoperative culture- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Parvizi,J,2006	Low Quality	70	Intraoperative Fluid Culture	At least 3 of: 1)CRP >1mg/dL 2)ESR >30mm/hr 3)positive joint aspiration culture 4)purulent intraoperative tissue appearance 5)positive intraoperative culture	0.9|0.97	27.8|0.11	**STRONG**	**MODERATE**
Smith,E.B., 2014	High Quality	190	Tissue and/or Fluid Broth culture(increased turbidity and positive growth/culture)	MSIS criteria and 1 year clinical follow up	0.19|0.88	1.55|0.92	POOR	POOR
Parvizi,J,2006	Low Quality	70	Intraoperative Tissue Culture	At least 3 of: 1)CRP >1mg/dL 2)ESR >30mm/hr 3)positive joint aspiration culture 4)purulent intraoperative tissue appearance 5)positive intraoperative culture	0.85|1	53.6|0.17	**STRONG**	**MODERATE**

Table 99: intraoperative culture- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Aggarwal,V.K., 2013	High Quality	117	Swab culture(1 or more positive cultures)	MSIS(excluding index test)	0.7|0.885057	6.09|0.338961	**MODERATE**	WEAK
Aggarwal,V.K., 2013	High Quality	117	Swab culture(2 or more positive cultures)	MSIS(excluding index test)	0.533333|0.977011	23.2|0.477647	**STRONG**	WEAK
Suda,A.J., 2017	Moderate Quality	30	tissue and fluid culture (conventional microbiological methods)	MSIS criteria	0.85|0.94	15.23|0.16	**STRONG**	**MODERATE**
Aggarwal,V.K., 2013	High Quality	117	Tissue culture(1 or more positive cultures)	MSIS(excluding index test)	0.933333|0.977011	40.6|0.068235	**STRONG**	**STRONG**
Aggarwal,V.K., 2013	High Quality	117	Tissue culture(2 or more positive cultures)	MSIS(excluding index test)	0.633333|0.977011	27.55|0.375294	**STRONG**	WEAK
Atkins,BL,1998	Moderate Quality	297	Intraoperative Tissue Cultures(1 or more positive) (all)	Histology	0.83|0.81	4.33|0.21	WEAK	WEAK
Atkins,BL,1998	Moderate Quality	213	Intraoperative Tissue Cultures(1 or more positive)(patients with 3-6 samples)	Histology	0.83|0.79	4.01|0.22	WEAK	WEAK
Atkins,BL,1998	Moderate Quality	239	Intraoperative Tissue Cultures(1 or more positive)(patients operated on by most consistent sureons)	Histology	0.85|0.81	4.37|0.19	WEAK	**MODERATE**

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Atkins,BL,1998	Moderate Quality	297	Intraoperative Tissue Cultures(2 or more positive) (all)	Histology	0.71|0.97	25.87|0.3	**STRONG**	WEAK
Atkins,BL,1998	Moderate Quality	213	Intraoperative Tissue Cultures(2 or more positive)(patients with 3-6 samples)	Histology	0.66|0.97	24.11|0.35	**STRONG**	WEAK
Atkins,BL,1998	Moderate Quality	239	Intraoperative Tissue Cultures(2 or more positive)(patients operated on by most consistent sureons)	Histology	0.73|0.97	25|0.28	**STRONG**	WEAK
Atkins,BL,1998	Moderate Quality	297	Intraoperative Tissue Cultures(3 or more postive samples) (all)	Histology	0.66|1	168|0.34	**STRONG**	WEAK
Atkins,BL,1998	Moderate Quality	213	Intraoperative Tissue Cultures(3 or more postive samples)(patients with 3-6 samples)	Histology	0.62|0.99	114|0.38	**STRONG**	WEAK
Atkins,BL,1998	Moderate Quality	239	Intraoperative Tissue Cultures(3 or more postive samples)(patients operated on by most consistent sureons)	Histology	0.7|1	144|0.3	**STRONG**	WEAK
Schafer,P,2008	Moderate Quality	284	Intraoperative Tissue Cultures (1 or more)	Histology	0.94|0.67	2.87|0.09	WEAK	**STRONG**
Schafer,P,2008	Moderate Quality	284	Intraoperative Tissue Cultures (2 or more)	Histology	0.77|0.93	11.54|0.25	**STRONG**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Trampuz,A,2006	Moderate Quality	78	Intraoperative Tissue Cultures (1 or more)	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.75|0.91	8.1|0.28	**MODERATE**	WEAK
Trampuz,A,2006	Moderate Quality	78	Intraoperative Tissue Cultures (2 or more)	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.54|0.98	29.25|0.47	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	Intraoperative Tissue Cultures (1 or more)	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.73|0.91	8.04|0.29	**MODERATE**	WEAK
Trampuz,A,2007	Moderate Quality	331	Intraoperative Tissue Cultures (2 or more)	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.61|0.99	76.6|0.4	**STRONG**	WEAK

Table 100: intraoperative culture- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Spangehl,MJ,1999	Moderate Quality	168	Intraoperative Swab Cultures (>1/3 of samples positive)	At least 1 of: 1)open wound of sinus in communication with the joint 2)systemic infection with pain in the joint and purulent fluid within the joint 3)positive result on at least 3 investigations(ESR>30, CRP>10, preoperative aspiration with at least 1 positive culture, frozen section with >5PMN/HPF, intraoperative culture (>1/3 of cultures positive)	0.76|0.99	115|0.24	**STRONG**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Spangehl,MJ,1999	Moderate Quality	180	Intraoperative Tissue Cultures (>1/3 of sample positive)	At least 1 of: 1)open wound of sinus in communication with the joint 2)systemic infection with pain in the joint and purulent fluid within the joint 3)positive result on at least 3 investigations(ESR>30, CRP>10, preoperative aspiration with at least 1 positive culture, frozen section with >5PMN/HPF, intraoperative culture (>1/3 of cultures positive)	0.94|0.97	30.6|0.06	**STRONG**	**STRONG**

Figure 48: Meta-Analysis ROC Curve - Intraoperative Tissue Cultures(2 or more positive) Hip and Knee:

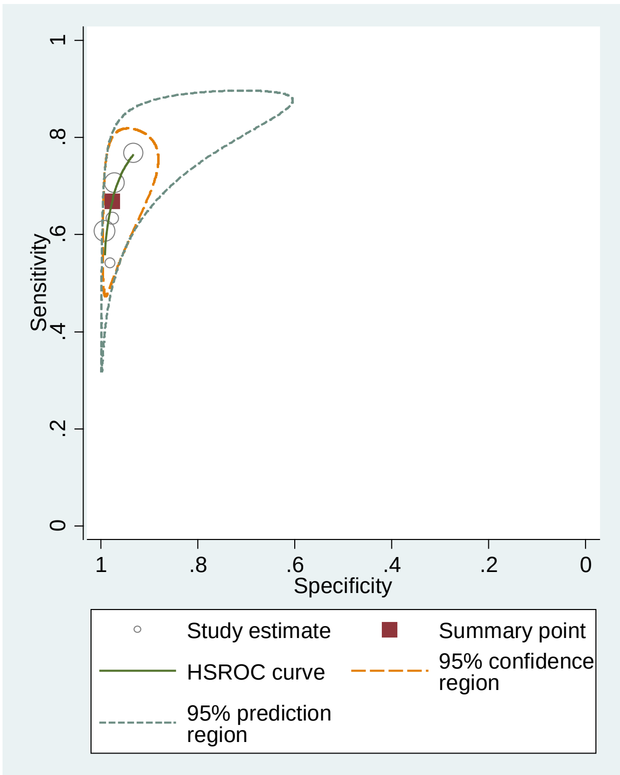


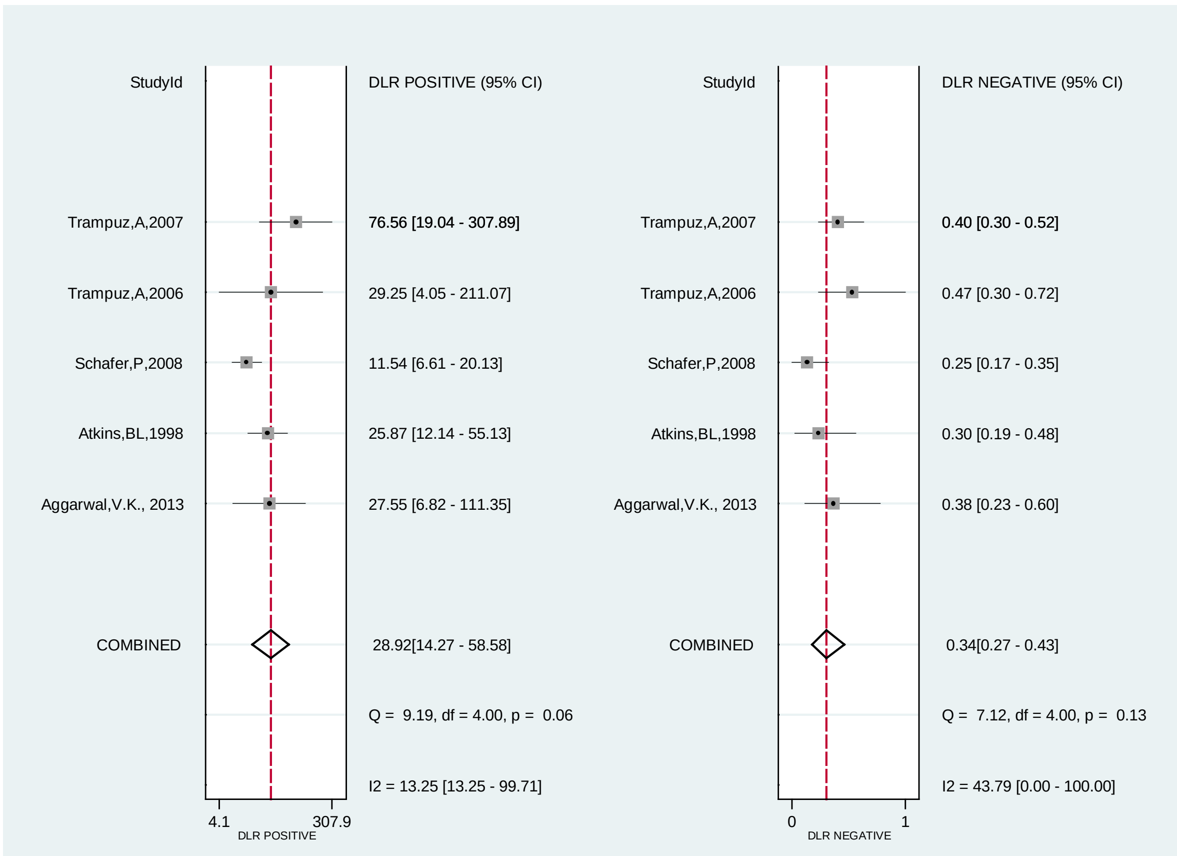
Table 101: meta-analysis statistics: Intraoperative Tissue Cultures(2 or more positive) Hip and Knee:

Log likelihood = -23.907166 Number of studies = 5

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	.7025237	.1849895			.3399511	1.065096
E(logitSp)	3.743469	.3977872			2.96382	4.523117
Var(logitSe)	.0777125	.0854435			.0090076	.6704581
Var(logitSp)	.4192588	.4119343			.0611155	2.876161
Corr(logits)	-1	.			.	.
HSROC						
Lambda	3.52695	.397983			2.746917	4.306982
Theta	-.692797	.5382132			-1.747675	.3620816
beta	.842736	.5617549	1.50	0.134	-.2582834	1.943755
s2alpha	0	.			.	.
s2theta	.1805039	.1585503			.032271	1.009628
Summary pt.						
Se	.6687471	.0409797			.5841786	.7436633
Sp	.9768755	.0089859			.9509126	.9892614
DOR	85.28448	28.94631			43.8495	165.8729
LR+	28.91948	10.41729			14.27491	58.58786
LR-	.3390943	.0403997			.2684778	.4282847
1/LR-	2.949032	.3513475			2.334895	3.724703

Covariance between estimates of E(logitSe) & E(logitSp) -.0386287

Figure 49: Meta-Analysis Forest Plot- Intraoperative Tissue Cultures(2 or more positive) Hip and Knee



Evidence Summary: Histology

There were three high quality studies, six moderate and one low quality study evaluating Histology(Della Valle 2007;Frances 2007;Ko 2005;Banit 2002;Boettner 2016;Fehring 1994;Kasparek 2016;Lonner 1996;Nunez 2007;Suda 2017). Two high and one moderate quality study evaluated knee patients (Della Valle 2007;Frances 2007;Banit 2002); one high and two moderate quality studies evaluated hip patients(Frances 2007;Banit 2002;Nunez 2007); one high, four moderate and one low quality study evaluated both hip and knee patients (Ko 2005;Boettner 2016;Fehring 1994;Kasparek 2016;Lonner 1996;Suda 2017). Positivity thresholds ranged from 5 PMN to 23 PMN.

A meta-analysis was conducted at a threshold of 5 PMN/HPF. This meta-analysis revealed histology to be a strong rule in test, with a pooled positive likelihood ratio of 13.82(7.29, 26.19). Due to high heterogeneity, the negative likelihood ratio is presented as a range, rather than a pooled effect. The negative LR ranged from .16 (moderate test) to .54(poor test). Sensitivity ranged from 48 to 86%, and specificity ranged from 87 to 97%.

At a threshold of 10 PMN/5HPF, the pooled positive likelihood ratio was 56.5(20.3,157.2), indicating a strong rule in test. The pooled specificity was 99%(96,1). There was high heterogeneity for pooled estimates of the negative LR and sensitivity. Sensitivity ranged from 39 to 88%, and the negative likelihood ratio ranged from .13(moderate test) to .62(poor test).

One moderate quality hip and knee study (Boettner 2016) evaluated a threshold of 5 PMN in 1 of 5 HPF. This test was a weak rule in test (positive LR=3.17) and a moderate rule out test (negative LR=.13). Two moderate quality studies evaluated a threshold of 10 PMN in 1 out of 5 HPF. This threshold was a moderate to strong rule in test (positive LR range: 5.56 to 17.86), and had negative likelihood ratios ranging from strong to poor(.05 to .59) as a rule out test.

Table 102: Summary of Findings- histology

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	Histology(10 PMN in 1 out of 5 HPF)	2M	5.56-17.86	0.05-0.59	0.45-1	0.84-0.96
	Histology(10 PMN/5 HPF)	1H/2M/1L	56.5(20.3,157.2)	0.13-0.62	0.39-0.88	0.99(0.96,1.00)
	Histology(23 PMN/10 HPF)	1M/1L	14.86-25	0.45-0.75	0.25-0.57	0.96-1
	Histology(5 PMN in 1 out of 5 HPF)	1M	3.17-3.17	0.13-0.13	0.9-0.9	0.71-0.71
	Histology(5 PMN/10 HPF)	1M	6.78-6.78	0.16-0.16	0.86-0.86	0.87-0.87
	Histology(5 PMN/5 HPF)	1H/2M	12.91-20.67	0.17-0.54	0.48-0.84	0.96-0.97
	Histology(5 PMN/HPF)	1H/3M	13.82(7.29, 26.19)	0.16-0.54	0.48-0.86	0.87-0.97
	Histology(average of more than 1 PMN from 10 HPFs)	1M	2.81-2.81	0.14-0.14	0.9-0.9	0.68-0.68
	Histology(no specific criteria of number per field)	1M	1.74-1.74	0.91-0.91	0.18-0.18	0.9-0.9
	Histology(undefined)	1M	15.68-15.68	0.47-0.47	0.55-0.55	0.96-0.96
Knee	Histology(10 PMN in 1 out of 5 HPF)	1M	17.86-17.86	0.05-0.05	1-1	0.96-0.96
	Histology(10 PMN/5 HPF)	1H	6.5-6.5	0.37-0.37	0.67-0.67	0.9-0.9
	Histology(avg. of >10 PMNs in the 5 most cellular HPF)	1H	23.27-23.27	0.13-0.13	0.88-0.88	0.96-0.96
Hip/Knee	Histology(10 PMN in 1 out of 5 HPF)	1M	5.56-5.56	0.11-0.11	0.91-0.91	0.84-0.84
	Histology(10 PMN/5 HPF)	2M	21.13-65.7	0.16-0.62	0.39-0.84	0.98-0.99
	Histology(23 PMN/10 HPF)	1M/1L	14.86-25	0.45-0.75	0.25-0.57	0.96-1
	Histology(5 PMN in 1 out of 5 HPF)	1M	3.17-3.17	0.13-0.13	0.9-0.9	0.71-0.71
	Histology(5 PMN/5 HPF)	1H/2M	12.91-20.67	0.17-0.54	0.48-0.84	0.96-0.97
	Histology(average of more than 1 PMN from 10 HPFs)	1M	2.81-2.81	0.14-0.14	0.9-0.9	0.68-0.68

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
	Histology(no specific criteria of number per field)	1M	1.74-1.74	0.91-0.91	0.18-0.18	0.9-0.9
	Histology(undefined)	1M	15.68-15.68	0.47-0.47	0.55-0.55	0.96-0.96
Hip	Histology(10 PMN in 1 out of 5 HPF)	1M	5.91-5.91	0.59-0.59	0.45-0.45	0.92-0.92
	Histology(10 PMN/5 HPF)	1H	76-76	0.5-0.5	0.5-0.5	1-1
	Histology(5 PMN/10 HPF)	1M	6.78-6.78	0.16-0.16	0.86-0.86	0.87-0.87

* study quality key: H=High, M=Moderate, L=Low

range presented when fewer than four studies or when meta-analysis indicated heterogeneity

positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2

negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 103: histology- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Banit,DM,2002	Moderate Quality	55	Frozen Section (>10 PMNs/HPF in any of the sampled areas)	Intraoperative Cultures	1|0.96	17.86|0.05	**STRONG**	**STRONG**
Frances,BA,2007	High Quality	63	Frozen Section (>10 PMNs/hpf in 5 fields)	Intraoperative Cultures	0.67|0.9	6.5|0.37	**MODERATE**	WEAK
Della,Valle,CJ,2007	High Quality	94	Frozen Section (avg. of >10 PMNs in the 5 most cellular HPF)	At least 2 of 3 positive intraoperative cultures on solid media or 2 of following: 1)one positive culture 2)final histopathology consistent with infection 3)gross purulence seen at time of revision	0.88|0.96	23.27|0.13	**STRONG**	**MODERATE**

Table 104: histology- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Boettner,F., 2016	Moderate Quality	77	frozen section Histology(Histology picture)	Culture	0.55|0.96	15.68|0.47	**STRONG**	WEAK
Boettner,F., 2016	Moderate Quality	77	frozen section Histology(5 HPF all showing more than 5 PML)	Culture	0.48|0.96	12.91|0.54	**STRONG**	POOR
Boettner,F., 2016	Moderate Quality	77	frozen section Histology(5 HPF all showing more than 10 PML)	Culture	0.39|0.98	21.13|0.62	**STRONG**	POOR
Boettner,F., 2016	Moderate Quality	77	frozen section Histology(5 HPF one showing at least 5 PML)	Culture	0.90|0.71	3.17|0.13	WEAK	**MODERATE**
Boettner,F., 2016	Moderate Quality	77	frozen section Histology(1 out of 5 HPF with more than 10 PML)	Culture	0.91|0.84	5.56|0.11	**MODERATE**	**MODERATE**
Boettner,F., 2016	Moderate Quality	77	frozen section Histology(10 HPF having an average of more than 1 PML)	Culture	0.90|0.68	2.81|0.14	WEAK	**MODERATE**
Fehring,TK,1994	Moderate Quality	97	Frozen Section (Presence of PMNs (no specific criteria of number per field)	Intraoperative Cultures	0.18|0.9	1.74|0.91	POOR	POOR
Kasparek,M.F., 2016	Moderate Quality	40	frozen section(was classifed according to the histopathological consensus classification of Morawietz et al)	MSIS	0.57|0.96	14.86|0.45	**STRONG**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Ko,PS,2005	High Quality	40	Frozen Section (>5 PMNs/HPF)	Intraoperative Cultures	0.67|0.97	20.67|0.34	**STRONG**	WEAK
Lonner,JH,1996	Moderate Quality	175	Frozen Section (10 PMN/HPF in 5 fields)	Intraoperative Cultures	0.84|0.99	65.7|0.16	**STRONG**	**MODERATE**
Lonner,JH,1996	Moderate Quality	175	Frozen Section (5 PMN/HPF in 5 fields)	Intraoperative Cultures	0.84|0.96	18.8|0.17	**STRONG**	**MODERATE**
Suda,A.J., 2017	Low Quality	30	Histopathological examination(classified according to Morawietz et al criteria)	MSIS criteria	0.25|1.00	25.00|0.75	**STRONG**	POOR

Table 105: histology- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Banit,DM,2002	Moderate Quality	63	Frozen Section (>10 PMNs/HPF in any of the sampled areas)	Intraoperative Cultures	0.45|0.92	5.91|0.59	**MODERATE**	POOR
Frances,BA,2007	High Quality	83	Frozen Section (>10 PMNs/HPF in 5 fields)	Intraoperative Cultures	0.5|1	76|0.5	**STRONG**	POOR
Nunez,LV,2007	Moderate Quality	136	Frozen Section (5 PMN/HPF; looked at 10 fields)	Intraoperative Cultures	0.86|0.87	6.78|0.16	**MODERATE**	**MODERATE**

Figure 50: Meta-Analysis ROC Curve- Histology: 5 PMN/HPF (3 hip/knee studies and 1 hip only study)

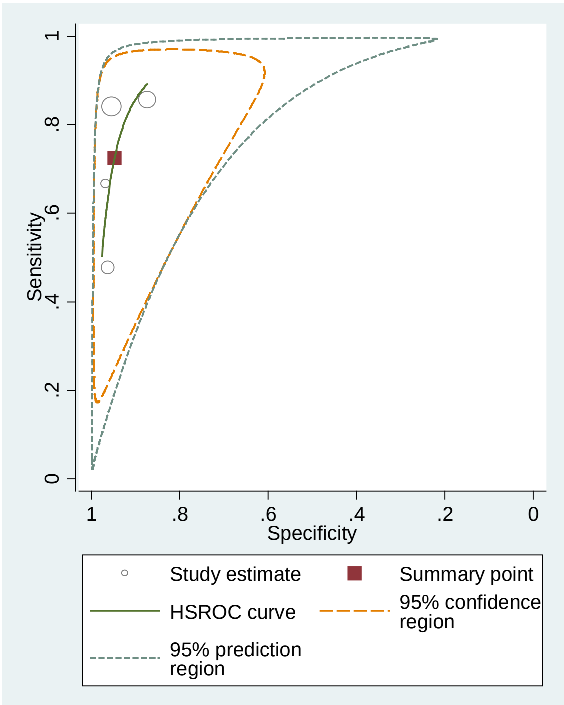


Table 106: meta-analysis statistics: Histology 5 PMN/HPF

Log likelihood = -18.306815 Number of studies = 4

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	.9744617	.4118738			.1672039	1.781719
E(logitSp)	2.891949	.3980494			2.111786	3.672111
Var(logitSe)	.4209371	.4322852			.0562429	3.150405
Var(logitSp)	.2988973	.3831324			.0242346	3.686453
Corr(logits)	-1	.			.	.
HSROC						
Lambda	4.044912	.6957694			2.681229	5.408595
Theta	-1.127934	.6782738			-2.457326	.201458
beta	-.1711916	.6440311	-0.27	0.790	-1.433469	1.091086
s2alpha	0	.			.	.
s2theta	.3547069	.3428159			.0533584	2.357958
Summary pt.						
Se	.7260079	.0819301			.5417039	.8559091
Sp	.947447	.0198194			.8920435	.9752076
DOR	47.7706	17.95226			22.87063	99.77998
LR+	13.81478	4.50743			7.288147	26.18608
LR-	.2891899	.0831759			.1645748	.5081629
1/LR-	3.457936	.9945603			1.967873	6.076266

Covariance between estimates of E(logitSe) & E(logitSp) -.0934284

Figure 51: Meta-Analysis ROC Curve – Histology 10 PMN/5HPF(1 hip, 1 knee and 2 hip/knee studies):

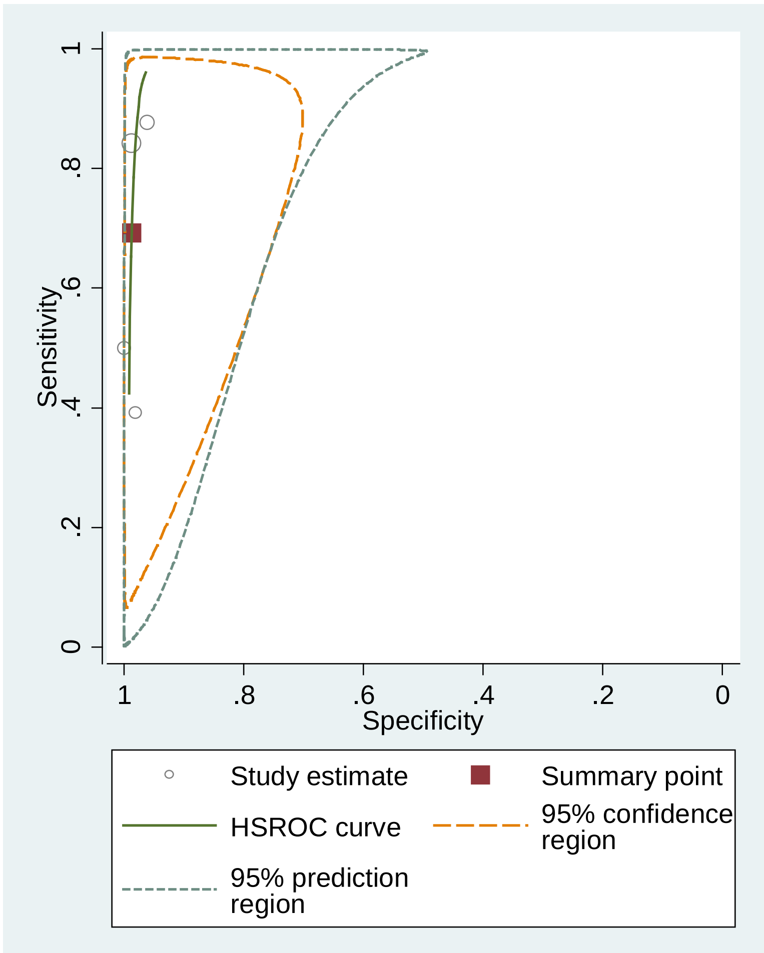


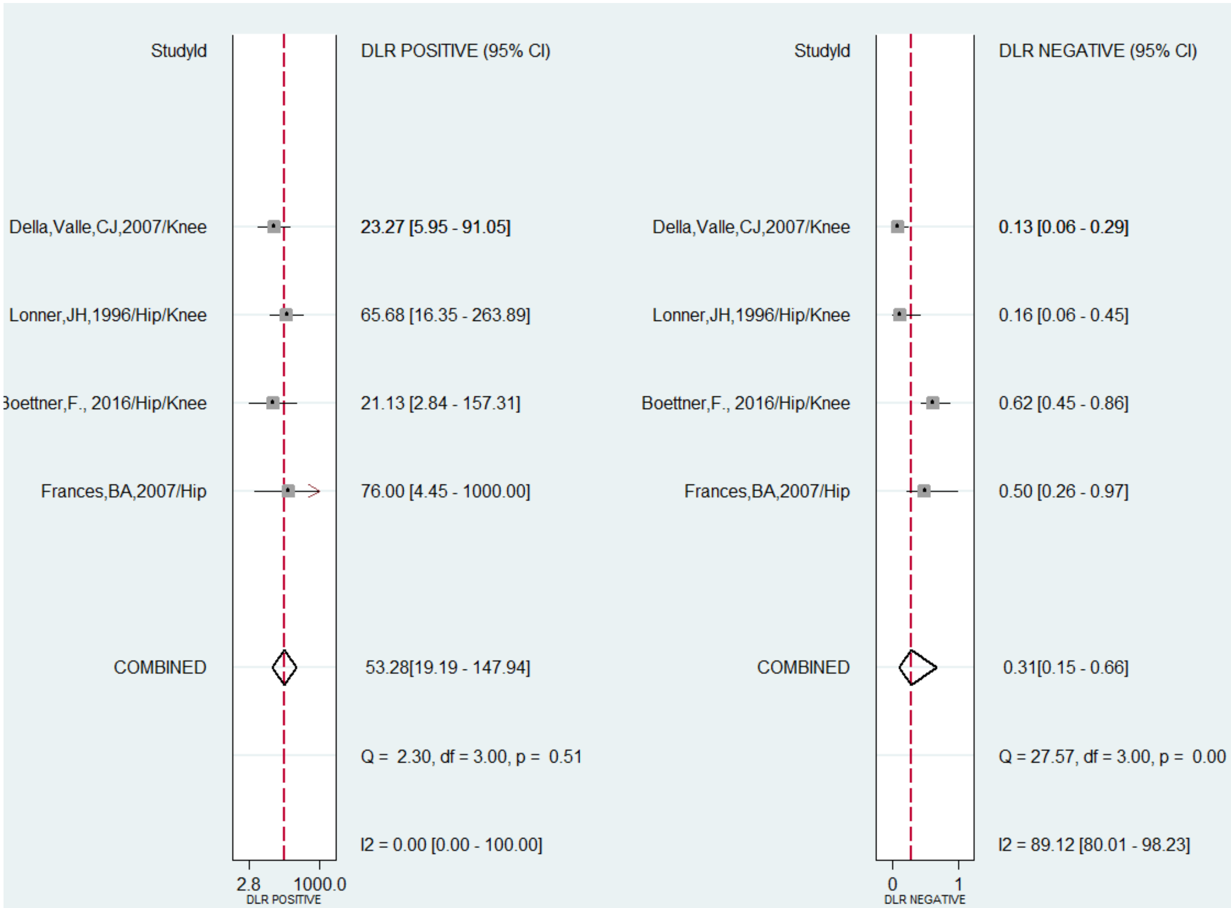
Table 107: meta-analysis statistics: Histology 10 PMN/5HPF (1 hip, 1 knee and 2 hip/knee studies)

Log likelihood = -16.042402 Number of studies = 4

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	.8129193	.5623223			-.2892122	1.915051
E(logitSp)	4.329632	.5639273			3.224355	5.43491
Var(logitSe)	.9546871	.8676493			.1607913	5.668387
Var(logitSp)	.1815239	.5209763			.0006546	50.3379
Corr(logits)	-1	.			.	.
HSROC						
Lambda	7.093466	3.975733			-.6988264	14.88576
Theta	-3.009929	2.358707			-7.63291	1.613051
beta	-.8299982	1.415957	-0.59	0.558	-3.605223	1.945226
s2alpha	0	.			.	.
s2theta	.4162914	.6616999			.0184673	9.384086
Summary pt.						
Se	.6927312	.1196929			.4281967	.8715855
Sp	.9869989	.0072364			.9617406	.9956573
DOR	171.1519	109.4971			48.84413	599.7237
LR+	53.28237	27.76009			19.19146	147.931
LR-	.3113162	.120479			.1458101	.6646848
1/LR-	3.212168	1.243105			1.504472	6.858233

Covariance between estimates of E(logitSe) & E(logitSp) -.1124602

Figure 52: Meta-Analysis Forest Plot: Histology 10 PMN/5HPF (1 hip, 1 knee and 2 hip/knee studies)



Evidence Summary: Sonication

There was one high and three moderate quality studies that evaluated implant sonication culture in hip and knee patients (Greenwood-Quaintance 2014;Janz 2013;Trampuz 2006;Trampuz 2007). The positivity thresholds ranged from 1 to 50 colony forming units. However, in two of the studies, the CFU positivity cutoff was undefined.

A meta-analysis of four studies was conducted for implant sonication. One study had a threshold of 5 CFU; one had a threshold of 20 CFU, and it was unclear what threshold the other two studies used. Because the studies used varying CFU cutpoints, computing a single average sensitivity, specificity and likelihood ratios was deemed inappropriate. Instead, this recommendation would more appropriately be made using the summary ROC curve(figure 6), and the parameters of the HSROC model in table 31. The Beta coefficient in the model indicates that there was significant variation in accuracy according to which CFU threshold was used to define a positive test. Therefore, the HSROC model parameters were used to compute the predicted specificity at three fixed points along the curve: using the median specificity among the studies, the lower quartile of specificity, and the upper quartile of specificity. These predicted sensitivities were then used to compute likelihood ratios for each of these three points on the curve.

The median specificity was 93%; the lower quartile was 83% and the upper quartile was 99%. At the median specificity of 93%, predicted sensitivity was 82.6%. The test was a strong rule in test (positive LR=11.68) and a moderate rule out test(negative LR=.19).

At the lower quartile of study specificity,83%, using lower positivity thresholds, the predicted sensitivity was 86.2%. Using these numbers, the test was a weaker, but still moderately strong rule-in test (Positive LR=5.01). It was also a moderately strong rule out test (negative LR=.17).

At the upper quartile specificity of 99%, using higher positivity thresholds, the predicted sensitivity was 73.1%. This resulted in a strong rule in test (positive LR=76.67), but a weaker rule out test (negative LR=.271).

One moderate quality hip and knee study evaluated sonicate fluid gram stain. While the test was a strong rule in test (positive LR=224. 92), it was a poor rule out test (negative LR=.55).

One high and two low quality hip and knee studies(Greenwood-Quaintance 2014; Cazanave 2013; Gomez 2012), and one low quality knee study(Ryu 2014) evaluated sonicate fluid PCR. The test was a moderate to strong rule in test (positive LR range= 8.71-78.26) and was moderate to weak rule out test (negative LR range=0.19-0.30).

Table 108: Summary of Findings sonication

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	sonicate fluid Gram staining(undefined)	1M	224.92-224.92	0.55-0.55	0.45-0.45	1-1
	sonicate fluid PCR	1H/3L	8.71-78.26	0.19-0.30	0.70-0.83	0.91-1
	Sonicate fluid culture(undefined)	2M	4.25-5.79	0.11-0.29	0.75-0.91	0.79-0.87
	sonicate fluid culture (1 or more CFU)	1M	7.29-7.29	0.21-0.21	0.81-0.81	0.89-0.89
	sonicate fluid culture (2 CFU)	1M	25.12-25.12	0.21-0.21	0.8-0.8	0.97-0.97
	sonicate fluid culture (3 CFU)	1M	40.19-40.19	0.21-0.21	0.8-0.8	0.98-0.98
	sonicate fluid culture (4 CFU)	1M	39.55-39.55	0.22-0.22	0.78-0.78	0.98-0.98
	sonicate fluid culture (5 CFU)	1M	65.92-65.92	0.22-0.22	0.78-0.78	0.99-0.99
	sonicate fluid culture (50 CFU)	1M	172.25-172.25	0.32-0.32	0.68-0.68	1-1
	sonicate fluid culture (6 CFU)	1M	65.92-65.92	0.22-0.22	0.78-0.78	0.99-0.99
	sonicate fluid culture (7 CFU)	1M	63.8-63.8	0.24-0.24	0.76-0.76	0.99-0.99
	sonicate fluid culture (8 CFU)	1M	62.73-62.73	0.26-0.26	0.75-0.75	0.99-0.99
	sonicate fluid culture (9 CFU)	1M	61.67-61.67	0.27-0.27	0.73-0.73	0.99-0.99
	sonicate fluid culture (10 CFU)	1M	60.61-60.61	0.28-0.28	0.72-0.72	0.99-0.99
	Sonicate fluid culture(20 CFU)	1H	38.09-104.54	0.24-0.3	0.7-0.77	0.98-0.99
	sonicate fluid culture (25 CFU)	1M	87.72-87.72	0.31-0.31	0.7-0.7	0.99-0.99
Knee	sonicate fluid PCR	1L	78.26-78.26	0.22-0.22	0.78-0.78	1-1
Hip/Knee	Sonicate fluid culture(20 CFU)	1H	38.09-104.54	0.24-0.3	0.7-0.77	0.98-0.99
	Sonicate fluid culture(undefined)	2M	4.25-5.79	0.11-0.29	0.75-0.91	0.79-0.87
	sonicate fluid Gram staining(undefined)	1M	224.92-224.92	0.55-0.55	0.45-0.45	1-1
	sonicate fluid PCR	1H/2L	8.71-36.71	0.19-0.30	0.70-0.83	0.91-0.98
	sonicate fluid culture (1 or mo CFU)	1M	7.29-7.29	0.21-0.21	0.81-0.81	0.89-0.89
	sonicate fluid culture (10 CFU)	1M	60.61-60.61	0.28-0.28	0.72-0.72	0.99-0.99
	sonicate fluid culture (2 CFU)	1M	25.12-25.12	0.21-0.21	0.8-0.8	0.97-0.97

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
	sonicate fluid culture (25 CFU)	1M	87.72-87.72	0.31-0.31	0.7-0.7	0.99-0.99
	sonicate fluid culture (3 CFU)	1M	40.19-40.19	0.21-0.21	0.8-0.8	0.98-0.98
	sonicate fluid culture (4 CFU)	1M	39.55-39.55	0.22-0.22	0.78-0.78	0.98-0.98
	sonicate fluid culture (5 CFU)	1M	65.92-65.92	0.22-0.22	0.78-0.78	0.99-0.99
	sonicate fluid culture (50 CFU)	1M	172.25-172.25	0.32-0.32	0.68-0.68	1-1
	sonicate fluid culture (6 CFU)	1M	65.92-65.92	0.22-0.22	0.78-0.78	0.99-0.99
	sonicate fluid culture (7 CFU)	1M	63.8-63.8	0.24-0.24	0.76-0.76	0.99-0.99
	sonicate fluid culture (8 CFU)	1M	62.73-62.73	0.26-0.26	0.75-0.75	0.99-0.99
	sonicate fluid culture (9 CFU)	1M	61.67-61.67	0.27-0.27	0.73-0.73	0.99-0.99

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 109: sonication culture- Hip_Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Greenwood-Quaintance,K.E., 2014	High Quality	431	Sonicate fluid culture(growth of 20 CFU/10 mL unconcentrated sonicate fluid)	MSIS or ISDA criteria	0.70|0.99	97.28|0.30	**STRONG**	WEAK
Greenwood-Quaintance,K.E., 2014	High Quality	431	Sonicate fluid culture(growth of 20 CFU/10 mL unconcentrated sonicate fluid)	ISDA criteria	0.73|0.99	104.54|0.27	**STRONG**	WEAK
Greenwood-Quaintance,K.E., 2014	High Quality	431	Sonicate fluid culture(growth of 20 CFU/10 mL unconcentrated sonicate fluid)	MSIS criteria	0.77|0.98	38.09|0.24	**STRONG**	WEAK
Janz,V., 2013	Moderate Quality	59	Sonication(culture)	preop fluid cultures in concordence with positive tissue culture, or 2 positive tissue cultures	0.91|0.79	4.25|0.11	WEAK	**MODERATE**
Trampuz,A,2006	Moderate Quality	78	sonicate fluid cultures	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.75|0.87	5.79|0.29	**MODERATE**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (1 or mo CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.81|0.89	7.29|0.21	**MODERATE**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (10 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.72|0.99	60.61|0.28	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (2 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.8|0.97	25.12|0.21	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (25 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.7|0.99	87.72|0.31	**STRONG**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (3 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.8|0.98	40.19|0.21	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (4 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.78|0.98	39.55|0.22	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (5 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.78|0.99	65.92|0.22	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (50 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.68|1	172.25|0.32	**STRONG**	WEAK

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (6 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.78|0.99	65.92|0.22	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (7 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.76|0.99	63.8|0.24	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (8 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.75|0.99	62.73|0.26	**STRONG**	WEAK
Trampuz,A,2007	Moderate Quality	331	sonicate fluid culture (9 CFU (colony forming unit per agar plate))	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.73|0.99	61.67|0.27	**STRONG**	WEAK

Table 110: sonication gram stain- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Trampuz,A,2007	Moderate Quality	326	sonicate fluid Gram staining	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating with the prosthesis	0.45|1	224.92|0.55	**STRONG**	POOR

Table 111: sonication PCR- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Ryu,S.Y., 2014	Low Quality	36	sonicate fluid PCR(10 assay panels any positive result)	composite; histopathology, microbiology, purulence, sinus draining	0.78|1.00	78.26|0.22	**STRONG**	WEAK

Table 112: sonication PCR- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Cazanave, C,. 2013	Low Quality	434	Sonicate fluid PCR (10-assay panel)	acute inflammation on periprosthetic tissue histopathology, joint space purulence, or a sinus tract	0.77|0.98	36.71|0.24	**STRONG**	WEAK
Gomez E., 2012	Low Quality	366	Sonicate fluid PCR (CP 26 cycles)	synovial fluid or periprosthetic purulence, sinus tract communicating with the prosthesis, and periprosthetic tissue histopathology showing acute inflammation	0.70|0.98	32|0.0.30	**STRONG**	WEAK
Gomez E., 2012	Low Quality	366	Sonicate fluid PCR - higher cutoff (CP 27.59 cycles)	synovial fluid or periprosthetic purulence, sinus tract communicating with the prosthesis, and periprosthetic tissue histopathology showing acute inflammation	0.80|.91	8.71|.22	**MODERATE**	WEAK
Greenwood-Quaintance,K.E., 2014	High Quality	431	Sonicate fluid PCR-ESI/MS(PCR panel assay)	MSIS or ISDA criteria	0.78|0.94	12.03|0.24	**STRONG**	WEAK
Greenwood-Quaintance,K.E., 2014	High Quality	431	Sonicate fluid PCR-ESI/MS(PCR panel assay)	MSIS criteria	0.83|0.91	9.48|0.19	**MODERATE**	**MODERATE**

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Greenwood-Quaintance,K.E., 2014	High Quality	431	Sonicate fluid PCR-ESI/MS(PCR panel assay)	ISDA criteria	0.81|0.94	12.84|0.20	**STRONG**	WEAK

Figure 53: Meta-Analysis ROC Curve –Implant Sonication (4 hip/knee studies; positive thresholds of studies: 5 CFU -1 study ; 20 CFU 1 study; CFU undefined- 2 studies)

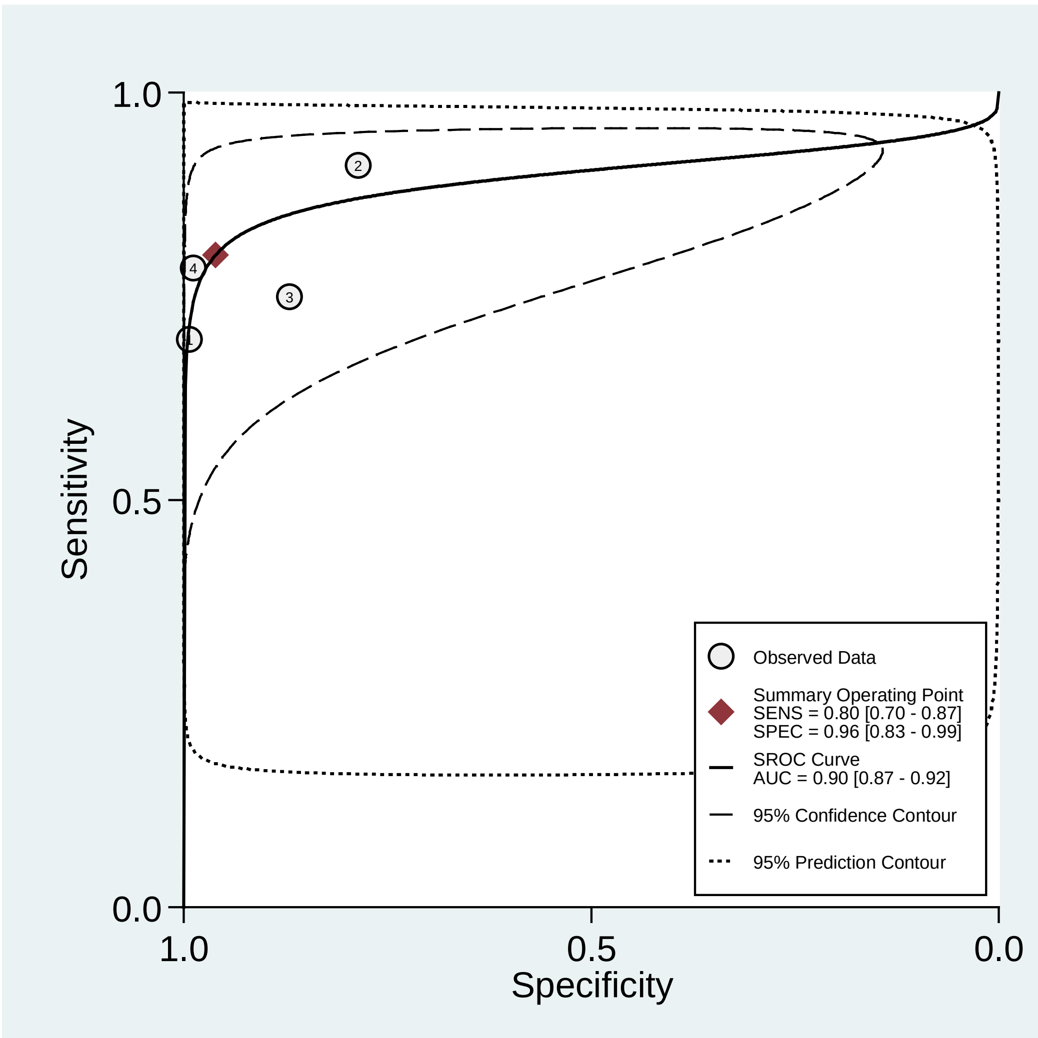


Table 113: meta-analysis statistics: Implant Sonication (4 hip/knee studies; positive thresholds of studies: 5 CFU -1 study ; 20 CFU 1 study; CFU undefined- 2 studies)

Log likelihood = -22.336957 Number of studies = 4

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bivariate						
E(logitSe)	1.391243	.2760239			.8502458	1.932239
E(logitSp)	3.197042	.8096197			1.610217	4.783867
Var(logitSe)	.1656172	.1851834			.0185073	1.48207
Var(logitSp)	2.268585	1.882475			.4460946	11.53674
Corr(logits)	-1	.			.	.
HSROC						
Lambda	4.338315	.3386788			3.674517	5.002113
Theta	.5073301	.587865			-.6448642	1.659524
beta	1.308616	.4840163	2.70	0.007	.3599617	2.257271
s2alpha	0	.			.	.
s2theta	.6129574	.525549			.1141855	3.290406
Summary pt.						
Se	.8007905	.0440327			.7006187	.8734971
Sp	.9607228	.0305506			.8334414	.9917058
DOR	98.32561	63.91142			27.50347	351.5165
LR+	20.38818	15.10455			4.772736	87.09426
LR-	.2073537	.0415455			.1400119	.3070852
1/LR-	4.822677	.966273			3.256426	7.142252

Covariance between estimates of E(logitSe) & E(logitSp) -.1545881

Evidence Summary: Tissue PCR

One moderate quality hip and knee study (Suda 2017) and one low quality knee study(Ryu 2014) evaluated tissue PCR. Both studies suggested this is a weak rule in test (positive LR range=2.92-4.84) and a poor rule out test (negative LR=0.77-0.87).

Table 114: Summary of Findings Tissue PCR

patients	index test	number of studies/ quality*	positive liklihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	Tissue PCR	1M/1L	2.92-4.84	0.77-0.87	0.16-0.31	0.89-0.97
Knee	Tissue PCR	1L	4.84-4.84	0.87-0.87	0.16-0.16	0.97-0.97
Hip/Knee	Tissue PCR	1M	2.92-2.92	0.77-0.77	0.31-0.31	0.89-0.89

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 115: tissue PCR- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Ryu,S.Y., 2014	Low Quality	95	Tissue PCR(8 assay panels any positive result)	composite; histopathology, microbiology, purulence, sinus draining	0.16|0.97	4.84|0.87	WEAK	POOR

Table 116: tissue PCR- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Suda,A.J., 2017	Moderate Quality	30	Multiplex PCR(sensitivity and specifities calculated for frequences reported in 2nd paragraph of results section. We didn't use post-hoc analysis that classified 2 false positives as true negatives)	MSIS criteria	0.31|0.89	2.92|0.77	WEAK	POOR

ADVANCED IMAGING SECTION

Quality Evaluation Table 6 Advanced Imaging

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Chacko,T.K., 2002	●	◑	●	●	●	○	Include	Moderate Quality
Chryssikos,T., 2008	●	●	●	●	●	●	Include	High Quality
Cyteval,C., 2002	●	●	○	●	◑	●	Include	Moderate Quality
Kumar,R., 2016	●	●	●	◑	●	●	Include	High Quality
Li,A.E., 2016	●	●	○	○	●	●	Include	Low Quality
Stumpe,K.D., 2004	●	●	●	○	●	◑	Include	Moderate Quality

Evidence Summary: Computed Tomography(CT)

One moderate quality hip study evaluated the diagnostic accuracy of computed tomography(CT) (Cyteval 2002). The study used several different measures, including joint distention, fluid-filled bursae, and fluid collection in muscles and perimuscular fat(for the complete list see table 1 of the draft document). CT may be useful for ruling in infection, with positive likelihood ratios(LR's) ranging from poor to strong(positive LR range=.29 to 45.69). Seven of the 11 CT measures had positive LR's over 2(see table 1 for specific measure results), indicating that CT might be useful as a rule in test. The four CT measures under two(indicating a poor rule in test) were: focal low attenuation, bone abnormalities, nonfocal low attenuation and asymmetric position of femoral head.

However, the study indicated that CT may not be as good of a rule out test(negative LR range=.04 to 1.28). Nine of 11 CT measures had negative LR's over .5, indicating a very low decrease in probability of PJI with a negative test result(see table 1 of draft document for specific CT results). The only two CT measures without poor negative LR's were soft tissue abnormalities(negative LR=.04, strong rule out test), and joint distention(negative LR=.17, moderate rule out test).

Evidence Summary: F-FDG PET/CT

One high quality hip study evaluated F-FDG PET/CT(Kumar 2016). The test was both a strong rule in and strong rule out test(positive LR=12.19, negative LR=.07). This means there was a large change in PJI probability depending on the test result.

Evidence Summary: F-Fluoride PET/CT

One high quality hip study evaluated F-Fluoride PET/CT(Kumar 2016). The test was strong at ruling in infection (positive LR=19.5), and weak at ruling out PJI(negative LR=.26).

Evidence Summary: MRI

One low quality knee study evaluated MRI(Li 2016). A single low quality study is considered very low strength of evidence, so a recommendation cannot be made. The study evaluated the test using two separate readers; one with one year of experience and the other with 2 years' experience. MRI was a moderate to strong rule in test (positive LR range =5-92.31). As a rule out test, the range of negative LR's was more varied, ranging from poor to strong (negative LR range=0.08-0.65).

Table 117: Summary of Findings Advanced Imaging

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	CT - asymmetric position of femoral head	1M	0.29-0.29	1.28-1.28	0.08-0.08	0.72-0.72
	CT - bone abnormalities	1M	1.07-1.07	0.83-0.83	0.75-0.75	0.3-0.3
	CT - fluid collections in muscles and perimuscular fat	1M	45.69-45.69	0.58-0.58	0.42-0.42	1-1
	CT - fluid-filled bursae	1M	3.68-3.68	0.66-0.66	0.42-0.42	0.89-0.89
	CT - fluid-filled bursae - greater trochanter	1M	17.67-17.67	0.68-0.68	0.33-0.33	0.98-0.98
	CT - fluid-filled bursae - iliopsoas	1M	2.65-2.65	0.83-0.83	0.25-0.25	0.91-0.91
	CT - focal low attenuation	1M	1.47-1.47	0.86-0.86	0.33-0.33	0.77-0.77
	CT - joint distention	1M	22.08-22.08	0.17-0.17	0.83-0.83	0.96-0.96
	CT - nonfocal low attenuation	1M	0.88-0.88	1.1-1.1	0.42-0.42	0.53-0.53
	CT - periostitis	1M	20.77-20.77	0.82-0.82	0.17-0.17	1-1
	CT - soft-tissue abnormalities	1M	6.92-6.92	0.04-0.04	1-1	0.87-0.87
	F FDG PET/CT	1H	12.19-12.19	0.07-0.07	0.94-0.94	0.92-0.92
	F-Fluoride PET/CT	1H	19.5-19.5	0.26-0.26	0.75-0.75	0.96-0.96
	FDG-labelled leucocyte PET/CT	1H	36.4-36.4	0.07-0.07	0.93-0.93	0.97-0.97
	MR imaging	1L	5-92.31	0.08-0.65	0.4-0.92	0.92-1
Knee	MR imaging	1L	5-92.31	0.08-0.65	0.4-0.92	0.92-1
Hip/Knee	FDG-labelled leucocyte PET/CT	1H	36.4-36.4	0.07-0.07	0.93-0.93	0.97-0.97
Hip	CT - asymmetric position of femoral head	1M	0.29-0.29	1.28-1.28	0.08-0.08	0.72-0.72
	CT - bone abnormalities	1M	1.07-1.07	0.83-0.83	0.75-0.75	0.3-0.3
	CT - fluid collections in muscles and perimuscular fat	1M	45.69-45.69	0.58-0.58	0.42-0.42	1-1
	CT - fluid-filled bursae - greater trochanter	1M	17.67-17.67	0.68-0.68	0.33-0.33	0.98-0.98
	CT - fluid-filled bursae - iliopsoas	1M	2.65-2.65	0.83-0.83	0.25-0.25	0.91-0.91
	CT - fluid-filled bursae	1M	3.68-3.68	0.66-0.66	0.42-0.42	0.89-0.89

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
	CT - focal low attenuation	1M	1.47-1.47	0.86-0.86	0.33-0.33	0.77-0.77
	CT - joint distention	1M	22.08-22.08	0.17-0.17	0.83-0.83	0.96-0.96
	CT - nonfocal low attenuation	1M	0.88-0.88	1.1-1.1	0.42-0.42	0.53-0.53
	CT - periostitis	1M	20.77-20.77	0.82-0.82	0.17-0.17	1-1
	CT - soft-tissue abnormalities	1M	6.92-6.92	0.04-0.04	1-1	0.87-0.87
	F FDG PET/CT	1H	12.19-12.19	0.07-0.07	0.94-0.94	0.92-0.92
	F-Fluoride PET/CT	1H	19.5-19.5	0.26-0.26	0.75-0.75	0.96-0.96

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 118: CT- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Cyteval,C,2002	Moderate Quality	65	CT - asymmetric position of femoral head	Intraoperative Cultures (2 or more)	0.08|0.72	0.29|1.28	POOR	POOR
Cyteval,C,2002	Moderate Quality	65	CT - periostitis	Intraoperative Cultures (2 or more)	0.17|1	20.77|0.82	**STRONG**	POOR
Cyteval,C,2002	Moderate Quality	65	CT - fluid-filled bursae - iliopsoas	Intraoperative Cultures (2 or more)	0.25|0.91	2.65|0.83	WEAK	POOR
Cyteval,C,2002	Moderate Quality	65	CT - focal low attenuation	Intraoperative Cultures (2 or more)	0.33|0.77	1.47|0.86	POOR	POOR
Cyteval,C,2002	Moderate Quality	65	CT - fluid-filled bursae - greater trochanter	Intraoperative Cultures (2 or more)	0.33|0.98	17.67|0.68	**STRONG**	POOR
Cyteval,C,2002	Moderate Quality	65	CT - nonfocal low attenuation	Intraoperative Cultures (2 or more)	0.42|0.53	0.88|1.1	POOR	POOR
Cyteval,C,2002	Moderate Quality	65	CT - fluid-filled bursae	Intraoperative Cultures (2 or more)	0.42|0.89	3.68|0.66	WEAK	POOR
Cyteval,C,2002	Moderate Quality	65	CT - fluid collections in muscles and perimuscular fat	Intraoperative Cultures (2 or more)	0.42|1	45.69|0.58	**STRONG**	POOR
Cyteval,C,2002	Moderate Quality	65	CT - bone abnormalities	Intraoperative Cultures (2 or more)	0.75|0.3	1.07|0.83	POOR	POOR
Cyteval,C,2002	Moderate Quality	65	CT - joint distention	Intraoperative Cultures (2 or more)	0.83|0.96	22.08|0.17	**STRONG**	**MODERATE**
Cyteval,C,2002	Moderate Quality	65	CT - soft-tissue abnormalities	Intraoperative Cultures (2 or more)	1|0.87	6.92|0.04	**MODERATE**	**STRONG**

Table 119: MRI- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Li,A.E., 2016	Low Quality	108	MR imaging Reader A- one year experience(Accuracy of Lamellated and Hyperintense Synovitis for Diagnosis of Infection)	surgical diagnosis reports of reason for revision and microbiology reports	0.78|0.99	66.52|0.22	**STRONG**	WEAK
Li,A.E., 2016	Low Quality	108	MR imaging Reader B- two years experience(Accuracy of Lamellated and Hyperintense Synovitis for Diagnosis of Infection)	surgical diagnosis reports of reason for revision and microbiology reports	0.65|0.98	27.72|0.36	**STRONG**	WEAK
Li,A.E., 2016	Low Quality	35	MR imaging Reader A- one year experience(Accuracy of Lamellated and Hyperintense Synovitis for Diagnosis of Infection)	surgical diagnosis reports of reason for revision and microbiology reports	0.60|0.96	15.00|0.42	**STRONG**	WEAK
Li,A.E., 2016	Low Quality	35	MR imaging Reader B- two years experience(Accuracy of Lamellated and Hyperintense Synovitis for Diagnosis of Infection)	surgical diagnosis reports of reason for revision and microbiology reports	0.40|0.92	5.00|0.65	**MODERATE**	POOR

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Li,A.E., 2016	Low Quality	73	MR imaging Reader A- one year experience(Accuracy of Lamellated and Hyperintense Synovitis for Diagnosis of Infection)	surgical diagnosis reports of reason for revision and microbiology reports	0.92|1.00	92.31|0.08	**STRONG**	**STRONG**
Li,A.E., 2016	Low Quality	73	MR imaging Reader B- two years experience(Accuracy of Lamellated and Hyperintense Synovitis for Diagnosis of Infection)	surgical diagnosis reports of reason for revision and microbiology reports	0.85|1.00	84.62|0.15	**STRONG**	**MODERATE**

Table 120: PET/CT- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Kumar,R., 2016	High Quality	42	F-Fluoride PET/CT()	1 Presence of =5 neutrophils per HPF (9400) in at least five separate fields was classified as infective pathology. 2 Presence of <5 neutrophils per HPF (9400) in at least five separate fields was classified as aseptic loosening.	0.75|0.96	19.50|0.26	**STRONG**	WEAK
Kumar,R., 2016	High Quality	42	F FDG PET/CT()	1 Presence of =5 neutrophils per HPF (9400) in at least five separate fields was classified as infective pathology. 2 Presence of <5 neutrophils per HPF (9400) in at least five separate fields was classified as aseptic loosening.	0.94|0.92	12.19|0.07	**STRONG**	**STRONG**

NUCLEAR IMAGING SECTION

Quality Evaluation Table 7- Nuclear Imaging

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Chik,K.K., 1996	●	◑	◑	◑	●	●	Include	Moderate Quality
Glithero,P.R., 1993	●	◑	●	◑	◑	●	Include	Moderate Quality
Hill,D.S., 2017	●	◑	●	◑	◑	●	Include	Moderate Quality
Kraemer,W.J., 1993	●	◑	○	◑	◑	●	Include	Low Quality
Larikka,M.J., 2001	●	●	●	●	●	○	Include	Moderate Quality
Larikka,M.J., 2002	●	●	◑	◑	◑	◑	Include	Low Quality
Levitsky,K.A., 1991	●	◑	●	●	◑	●	Include	Moderate Quality
Rand,J.A., 1990	●	◑	●	●	◑	◑	Include	Moderate Quality
Savarino,L., 2004	●	●	●	◑	◑	●	Include	Moderate Quality
Scher,D.M., 2000	●	●	●	●	◑	●	Include	High Quality
Segura,A.B., 2004	●	●	◑	◑	◑	●	Include	Moderate Quality
von,Rothenburg T., 2004	●	◑	◑	◑	○	●	Include	Low Quality

Evidence Summary: Technetium-99- or Indium-111-labeled-Leukocyte Imaging

Two moderate quality studies evaluated Indium-111-labeled-Leukocyte Imaging (Glithero 1993; Rand 1990). Glithero studied hip patients and found it was a strong rule in test with a positive likelihood ratio(LR) of 14, indicating that a positive result caused a strong increase in probability of PJI. However, the study found it to be a poor rule out test(negative LR=.63). Rand evaluated the test in knee patients and found it to be a moderately good rule in and rule out test(positive LR=5.56, negative LR=.2).

One high(Pelosi 2004), two moderate(Glithero 1993; Segura 2004) and one low quality study(Savarino 2004) evaluated Tc-99 leukocyte scintigraphy. Three studies evaluated the test in both hip/knee patients (Pelosi 2004; Glithero 1993; Segura 2004), and one studied only hip patients(Savarino 2004). No studies evaluated the test in only knee patients.

Estimates of positive and negative likelihood ratios for Tc-99 leukocyte imaging were heterogeneous in the included studies. The positive likelihood ratios from the studies indicated that it might be a useful rule in test, with estimates ranging from poor to strong(positive LR range=1.39-22.98). As a rule out test, negative LR's also ranged from poor to strong in the included studies (negative LR range=0.04-0.71), so the test may be useful in ruling out PJI.

One moderate quality study evaluated the diagnostic accuracy of either a positive Tc-99 or Indium-111-labeled-Leukocyte Imaging in both hip, and combined hip/knee. The study also evaluated a subgroup of knee patients, but there were less than 25 patients in this group, so the knee only results were not extracted. The test was strong at ruling in infection in both the hip and the combined hip/knee patients(positive LR = 16.5 and 34.89 respectively). However, it was a poor rule out test in both the hip and combined hip/knee groups(negative LR= 0.56 and 0.76 respectively).

Evidence Summary: Combined labeled-Leukocyte/Bone Imaging

One high and two moderate quality studies evaluated combined labeled leukocyte/bone imaging(Scher 2000;Pons 1999;Teller 2000). One study evaluated both hip and knee patient subgroups(Scher 2000); One study looked at combined hip/knee patients(Teller 2000) and another looked at only hip patients(Pons 1999). Two studies (Scher 2000; Teller 2000) evaluated Tc-99 bone scans and In-111 WBC scans. An additional study evaluated Tc-99 bone scans and Tc-99 white blood cell scans(Pons 1999). For these tests, positive LRs were in the weak to moderately strong rule in range (positive LR range=2.86-8.1). Negative LR's were also in the weak to moderately strong rule out range(0.15-0.47).

Evidence Summary: Combined labeled-Leukocyte/Bone Marrow Imaging

Two moderate quality studies evaluated combined labeled-leukocyte/bone marrow imaging (Joseph 2001;Segura 2004). The studies both evaluated combined hip and knee patients. Segura also evaluated a subgroup of hip only patients. Both studies found that it was a strong rule in tests(positive LR=19.6-45.5). Estimates of the negative LR's were more varied, ranging from a strong rule out test to a poor test (negative LR=0.07-0.66).

Evidence Summary: Technetium-99m Bone Imaging

Three moderate quality and one low quality study evaluated Technetium-99m Bone Imaging(Hill 2017;Levitsky 1991;Segura 2004;Bernay 1993). Three studies evaluated triple-phase Tc-99m bone scintigraphy(Hill 2017;Levitsky 1991;Bernay 1993). One study evaluated two-phase Tc-99m bone scintigraphy(Segura 2004). Estimates of the positive and negative LRs are varied, making it hard to determine with certainty if the test is effective. Positive LR's ranged from a poor to moderately good rule in test in the studies(positive LR range= 0.58-6), so it may be useful. The Negative LRs in the studies ranged from a poor to strong rule out test(negative LR range=0.05-1.72).

Evidence Summary: FDG-PET imaging

One high quality hip study(Chryssikos 2008) evaluated FDG-PET imaging. This was a strong rule in test, with a positive LR of 11.39. It was a moderately good rule out test, with a negative LR of .16.

Evidence Summary: Gallium-67 Imaging

One low quality hip study evaluated Gallium-67 Imaging (Kraemer 1993). The test was good at ruling in infection(positive LR=24.36), but poor at ruling out infection(negative LR=.62).

Table 121: Summary of Findings Nuclear Imaging

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	Combined labeled-Leukocyte/Bone Imaging	1H/2M	2.86-8.1	0.15-0.47	0.6-0.88	0.78-0.93
	Combined labeled-Leukocyte/Bone Marrow Imaging	2M	19.6-45.5	0.07-0.66	0.33-0.93	0.98-1
	FDG-PET Imaging	1H	11.39-11.39	0.16-0.16	0.85-0.85	0.93-0.93
	Gallium-67 Imaging	1L	24.36-24.36	0.62-0.62	0.38-0.38	1-1
	Indium-111-labeled-Leukocyte Imaging	2M	5.56-14	0.2-0.63	0.38-0.83	0.85-1
	Technetium-99 Leukocyte Imaging	1H/2M/1L	1.39-22.98	0.04-0.71	0.31-0.96	0.31-1
	Combined Technetium-99- or Indium-111-labeled-Leukocyte Imaging	1M	16.5-34.89	0.56-0.76	0.23-0.44	1-1
	Technetium-99m Bone Imaging	3M/1L	0.58-6	0.05-1.72	0.29-1	0-0.91
Knee	Combined labeled-Leukocyte/Bone Imaging	1H	4.06-4.06	0.15-0.15	0.88-0.88	0.78-0.78
	Indium-111-labeled-Leukocyte Imaging	1M	5.56-5.56	0.2-0.2	0.83-0.83	0.85-0.85
Hip/Knee	Combined labeled-Leukocyte/Bone Imaging	1M	2.86-2.86	0.47-0.47	0.64-0.64	0.78-0.78
	Combined labeled-Leukocyte/Bone Marrow Imaging	2M	28.67-45.5	0.07-0.54	0.47-0.93	0.98-1
	Technetium-99 Leukocyte Imaging	1H/2M	1.39-22.98	0.04-0.51	0.5-0.96	0.31-1
	Combined Technetium-99- or Indium-111-labeled-Leukocyte Imaging	1M	34.89-34.89	0.56-0.56	0.44-0.44	1-1
	Technetium-99m Bone Imaging	2M	0.99-4.31	0.68-1.72	0.33-1	0-0.91
Hip	Combined labeled-Leukocyte/Bone Imaging	1H/1M	6.3-8.1	0.43-0.44	0.6-0.6	0.9-0.93
	Combined labeled-Leukocyte/Bone Marrow Imaging	1M	19.6-30.8	0.46-0.66	0.33-0.56	1-1
	FDG-PET Imaging	1H	11.39-11.39	0.16-0.16	0.85-0.85	0.93-0.93
	Gallium-67 Imaging	1L	24.36-24.36	0.62-0.62	0.38-0.38	1-1

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
	Indium-111-labeled-Leukocyte Imaging	1M	14-14	0.63-0.63	0.38-0.38	1-1
	Technetium-99 Leukocyte Imaging	1L	7.12-17	0.52-0.71	0.31-0.5	1-1
	Combined Technetium-99- or Indium-111-labeled-Leukocyte Imaging	1M	16.5-16.5	0.76-0.76	0.23-0.23	1-1
	Technetium-99m Bone Imaging	1M/1L	0.58-6	0.05-1.42	0.29-1	0.5-0.86

* study quality key: H=High, M=Moderate, L=Low
range presented when fewer than four studies or when meta-analysis indicated heterogeneity
positive LR key: Strong Rule-out= ≥10 ; Moderate= ≥5 but <10; Weak=>2 but <5, Poor=≤2
negative LR key: Strong Rule-in= ≤.1 ; Moderate= >.1 but ≤.2; Weak= >.2 but <.5, Poor=≥.5

Table 122: Combined labeled-Leukocyte/Bone Imaging- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Scher,DM,2000	High Quality	40	Tc-99m HDP/In-111 leukocyte scan	At least 2 of: 1)positive intraoperative cultures (either broth or plate) 2)intraoperative findings of gross purulence within the joint 3)final permanent histologic section incidcating acute inflammation based on 10 or more PMN/HPF in 5 areas	0.88|0.78	4.06|0.15	WEAK	**MODERATE**

Table 123: Combined labeled-Leukocyte/Bone Imaging- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Teller,RE,2000	Moderate Quality	166	Tc-99m HPD/In-111 leukocyte scan	Intraoperative cultures of frank purulence	0.64|0.78	2.86|0.47	WEAK	WEAK

Table 124: Combined labeled-Leukocyte/Bone Imaging- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Pons,M,1999	Moderate Quality	78	Tc-99m MDP, Tc-99 HMPAO leukocyte scintigraphy	Intraoperative cultures and histology	0.6|0.9	6.3|0.44	**MODERATE**	WEAK
Scher,DM,2000	High Quality	91	Tc-99m HDP/In-111 leukocyte scan	At least 2 of: 1)positive intraoperative cultures (either broth or plate) 2)intraoperative findings of gross purulence within the joint 3)final permanent histologic section incidcating acute inflammation based on 10 or more PMN/HPF in 5 areas	0.6|0.93	8.1|0.43	**MODERATE**	WEAK

Table 125: Combined labeled-Leukocyte/Bone Marrow Imaging- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Joseph,TN,2001	Moderate Quality	58	In-111 leukocyte/Tc-99m sulfur colloid scans	at least 2 of: 1)positive intraoperative culture 2)final histology (>10 PMN/HPF in 5 areas) 3)intraoperative findings of gross purulence within the joint	0.47|1	41.25|0.54	**STRONG**	POOR
Joseph,TN,2001	Moderate Quality	58	In-111 leukocyte/Tc-99m sulfur colloid scans and with blood pooling and flow phase data	at least 2 of: 1)positive intraoperative culture 2)final histology (>10 PMN/HPF in 5 areas) 3)intraoperative findings of gross purulence within the joint	0.67|0.98	28.67|0.34	**STRONG**	WEAK
Segura,AB,2004	Moderate Quality	77	Tc-99m HMPAO leukocyte/Tc-99m stannous microcolloid bone marrow scan	Intraoperative cultures	0.93|0.98	45.5|0.07	**STRONG**	**STRONG**
Segura,AB,2004	Moderate Quality	77	Tc-99m HMPAO leukocyte/Tc-99m stannous microcolloid bone marrow scan/Tc-99m MDP bone scan	Intraoperative cultures	0.93|0.98	45.5|0.07	**STRONG**	**STRONG**

Table 126: Combined labeled-Leukocyte/Bone Marrow Imaging- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Joseph,TN,2001	Moderate Quality	36	In-111 leukocyte/Tc-99m sulfur colloid scans	at least 2 of: 1)positive intraoperative culture 2)final histology (>10 PMN/HPF in 5 areas) 3)intraoperative findings of gross purulence within the joint	0.33|1	19.6|0.66	**STRONG**	POOR
Joseph,TN,2001	Moderate Quality	36	In-111 leukocyte/Tc-99m sulfur colloid scans and with blood pooling and flow phase data	at least 2 of: 1)positive intraoperative culture 2)final histology (>10 PMN/HPF in 5 areas) 3)intraoperative findings of gross purulence within the joint	0.56|1	30.8|0.46	**STRONG**	WEAK

Table 127: FDG-PET Imaging- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Chryssikos,T,2008	High Quality	127	FDG-PET - increased FDG uptake at prosthesis-bone interface	At least 1 of: 1)an open wound or sinus communicating with the joint 2) systemic infection with pain in the hip and purulent fluid within the joint 3)positive result on at least 3 tests (ESR, CRP, joint aspiration, intraoperative frozen section, and intraoperative culture)	0.85|0.93	11.39|0.16	**STRONG**	**MODERATE**

Table 128: Indium-111-labeled-Leukocyte Imaging- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Glithero,PR,1993	Moderate Quality	25	In-111 leukocyte scan	Intraoperative cultures	0.38|1	14|0.63	**STRONG**	POOR

Table 129: Indium-111-labeled-Leukocyte Imaging - Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Rand,JA,1990	Moderate Quality	38	In-111 leukocyte scan	at least 2 of: 1)positive culture results 2)acute inflammatory histologic findings 3)clinical sepsis with pus within the joint	0.83|0.85	5.56|0.2	**MODERATE**	**MODERATE**

Table 130: Technetium-99 Leukocyte Imaging- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Glithero,PR,1993	Moderate Quality	31	Tc-99m HMPAO leukocyte scintigraphy	Intraoperative cultures	0.5|1	22|0.51	**STRONG**	POOR
Segura,AB,2004	Moderate Quality	77	Tc-99m HMPAO leukocyte scintigraphy	Intraoperative cultures	0.96|0.31	1.39|0.12	POOR	**MODERATE**
Pelosi,E., 2004	High Quality	95	99m Tc-HMPAO-leukocyte imaging (increased intensity in ROI compared to contralateral or ipsilateral adjacent bone segment)	intraoperative cultures, purulence, 1 year clinical follow up	0.96|0.96	22.98|0.04	**STRONG**	**STRONG**

Table 131: Technetium-99 Leukocyte Imaging- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Savarino,L,2004	Low Quality	26	Tc-99m-HMPAO granulocyte scintigraphy	Intraoperative cultures	0.31|1	7.12|0.71	**MODERATE**	POOR
Savarino,L,2004	Low Quality	26	Tc-99m-HMPAO granulocyte scintigraphy	Histology	0.42|1	12.69|0.6	**STRONG**	POOR
Savarino,L,2004	Low Quality	26	Tc-99m-HMPAO granulocyte scintigraphy	Intraoperative cultures and histology	0.5|1	17|0.52	**STRONG**	POOR

Table 132: Combined Technetium-99- or Indium-111-labeled-Leukocyte Imaging - Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Glithero,PR,1993	Moderate Quality	56	Tc-99m HMPAO or In-111-oxine leukocyte scan	Intraoperative cultures	0.44|1	34.89|0.56	**STRONG**	POOR

Table 133: Technetium-99- or Indium-111-labeled-Leukocyte Imaging- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Glithero,PR,1993	Moderate Quality	45	Tc-99m HMPAO or In-111-oxine leukocyte scan	Intraoperative cultures	0.23|1	16.5|0.76	**STRONG**	POOR

Table 134: Technetium-99m Bone Imaging- Hip/Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Levitsky,KA,1991	Moderate Quality	54	Tc-99m MDP 3-phase bone scintigraphy and plain radiographs	Intraoperative cultures and gross sepsis	0.38|0.91	4.31|0.68	WEAK	POOR
Levitsky,KA,1991	Moderate Quality	58	Tc-99m MDP 3-phase bone scintigraphy	Intraoperative cultures and gross sepsis	0.33|0.86	2.33|0.78	WEAK	POOR
Segura,AB,2004	Moderate Quality	77	Tc-99m MDP 2-phase bone scintigraphy	Intraoperative cultures	1|0	0.99|1.72	POOR	POOR

Table 135: Technetium-99m Bone Imaging- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Bernay,I,1993	Low Quality	31	Tc-99m MDP 3-phase scintigraphy	Pathological and gross operative findings	0.8|0.76	3.36|0.26	WEAK	WEAK
Bernay,I,1993	Low Quality	31	Tc-99m nanocolloid scintigraphy	Pathological and gross operative findings	1|0.86	6|0.05	**MODERATE**	**STRONG**
Hill,D.S., 2017	Moderate Quality	100	Technicium-99M(bone scan)	intraoperative findings, microbiological and histological samples	0.29|0.50	0.58|1.42	POOR	POOR

Table 136: Gallium-67 Imaging- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Kraemer,WJ,1993	Low Quality	43	Sequential Tc-99m bone scan/Ga-67 scan	Intraoperative cultures	0.38|1	24.36|0.62	**STRONG**	POOR

GRAM STAIN SECTION

Quality Evaluation Table 8: Gram Stain

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Zywiel,M.G., 2011	●	◑	●	●	◑	●	Include	Moderate Quality
Spangehl,M.J., 1999	●	●	◑	◑	◑	●	Include	Moderate Quality
Banit,D.M., 2002	●	●	●	●	◑	◑	Include	Moderate Quality
Parvizi, J., 2006	●	●	○	◑	◑	●	Include	Low Quality

Evidence Summary: Gram Stain:

Three moderate quality studies (Banit,DM,2002;Spangehl,MJ,1999;Zywiel,M.G., 2011) and one low quality study (Parvizi,J,2006) evaluated the diagnostic accuracy of gram stain. Three studies evaluated knee patients(Banit,DM,2002;Zywiel,M.G., 2011;Parvizi,J,2006) and two studies evaluated hip patients(Banit,DM,2002; Spangehl,MJ,1999). The studies found gram stain to be strong at ruling in infection (positive LR range=10.8-42.3). However, every study found it to be poor at ruling out infection (negative LR=.56-.93).

Table 137: Summary of Findings Gram Stain

patients	index test	number of studies/ quality*	positive likelihood ratio	negative likelihood ratio	sensitivity	specificity
Overall	Gram Stain	3M/1L	10.8-42.3	0.56-0.93	0.07-0.44	0.97-1
Hip	Gram Stain	2M	10.8-39.75	0.63-0.83	0.19-0.36	0.98-1
Knee	Gram Stain	2M/1L	11.13-42.3	0.56-0.93	0.07-0.44	0.97-1

Table 138: gram stain- Hip

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Banit,DM,2002	Moderate Quality	63	Gram stain	Intraoperative cultures	0.36|1	39.75|0.63	**STRONG**	POOR
Spangehl,MJ,1999	Moderate Quality	202	Gram stain(tissue)	At least 1 of: 1)open wound or sinus communicating with the joint 2)purulent fluid within the joint 3)positive investigations in a minumum of 3 of the following: ESR >30 mm/h, CRP >10mg/L, preoperative aspiration 1 positive culture, frozen section >5 PMNs/hpf, intraoperative culture >1/3 positive cultures	0.19|0.98	10.8|0.83	**STRONG**	POOR

Table 139: gram stain- Knee

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Banit,DM,2002	Moderate Quality	55	Gram stain	Intraoperative cultures	0.44|1	42.3|0.56	**STRONG**	POOR
Morgan,P.M., 2009	Low Quality	921	Gram stain ( )	3 of 5 Leone and Hanssen :(1) the presence of the same organism in two cultures, (2) growth of an organism on solid media as well as other objective evidence of infection such as elevated levels of inflammatory markers in the absence of systemic inflammatory disease or an elevated cell count and percentage of polymorphonuclear leukocytes in aspirated joint fluid, (3) histologic evidence of acute inflammation, (4) gross purulence at the time of surgery, or (5) an actively draining sinus.	0.27|1.00	182.83|0.73	**STRONG**	POOR
Parvizi,J,2006	Low Quality	70	Gram stain(tissue)	at least 3 of: 1)CRP >1mg/dL 2)ESR >30mm/hr 3)positive joint aspiration culture 4)purulent intraoperative tissue appearance 5)positive intraoperative culture	0.21|1	13.6|0.8	**STRONG**	POOR

Reference Title	Quality	N	Index Test	Reference Standard	Sens|Spec	LR+|LR-	Rule In Test	Rule Out Test
Parvizi,J,2006	Low Quality	70	Gram stain(fluid)	at least 3 of: 1)CRP >1mg/dL 2)ESR >30mm/hr 3)positive joint aspiration culture 4)purulent intraoperative tissue appearance 5)positive intraoperative culture	0.36|0.97	11.13|0.66	**STRONG**	POOR
Zywiel,M.G., 2011	Moderate Quality	347	Gram stain in swab samples (The presence of 10 or morepolymorphonuclear leukocytes in any single high-power field wasconsidered diagnostic for infection)	2 positve cultures, histology, gros purulence, sinustract	0.07|0.99	13.47|0.93	**STRONG**	POOR

WITHHOLDING ANTIBIOTICS FOR 2 WEEKS WHEN DIAGNOSIS HAS NOT BEEN ESTABLISHED SECTION

Quality Evaluation Table 9: withholding antibiotics for 2 weeks when diagnosis has not been established

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Trampuz, A., 2007	●	◑	●	●	◑	●	Include	Moderate Quality
Shahi,A., 2016	●	◑	●	○	◑	◑	Include	Low Quality

Figure 54: Summary of Findings: Use of antibiotics 2 weeks before PJI diagnosis is established.

↑ Less False Negatives ↓ More False Negatives ● Not Significant	Trampuz, A., 2007 Moderate Quality	Shahi,A., 2016 Low Quality
Hip/Knee Diagnosis Accuracy		
False negative PJI	↓	●

Table 140: Antibiotics 2 weeks before diagnosis is made: data

Author	Quality of evidence	N	Joint	Reference Standard	False Negatives	Statistic/result	Significance
Trampuz, A., 2007	Moderate	79	Hip/knee	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating withthe prosthesis	Antibiotics within 14 days: 55%;No antibiotics within 14 days: 23%	RR=2.38(1.26,4.51)	Receiving antibiotics within 2 weeks of culture increased risk of negative results
Shahi,A.,2016	Low	106	Hip/knee	International Consensus Meeting criteria	Antibiotics within 2 weeks:30%; no antibiotics within 2 weeks(33%)	OR=0.87(0.35,2.18)	NS

ANTIBIOTIC PROPHYLAXIS WHEN PJI DIAGNOSIS HAS ALREADY BEEN ESTABLISHED SECTION

Quality Evaluation Table 10 Diagnostic studies: preop antibiotic prophylaxis when PJI diagnosis has already been established

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Ghanem, E., 2007	●	◐	●	○	○	●	Include	Low Quality
Burnett,R.S., 2010	●	●	◐	◐	●	○	Include	Low Quality
Bedencic,K., 2016	●	●	●	●	●	●	Include	High Quality

Quality Evaluation Table 11: RCTs: preop antibiotic prophylaxis when PJI diagnosis has already been established

Study	Random Sequence Generation	Allocation Concealment	Blinding	Incomplete Outcome Data	Selective Reporting	Other Bias	Is there a large magnitude of effect?	Influence of All Plausible Residual Confounding	Dose-Response Gradient	Inclusion	Strength
Tetreault,M.W., 2014	●	●	◐	●	●	○	●	●	●	Include	High Quality
Carlsson,A.K., 1977	◐	◐	◐	○	◐	●	●	●	●	Include	Moderate Quality
Hill,C., 1981	●	●	○	○	○	●	●	●	●	Include	Moderate Quality
Doyon,F., 1987	●	●	○	○	○	●	●	●	●	Include	Moderate Quality

Figure 55: Summary of Findings: Use of Antibiotic Prophylaxis in Revision Surgery after Diagnosis Has Been Established(the effect of antibiotics on diagnostic accuracy)

↑ Better Accuracy ↓ Worse Accuracy ● Not Significant	High Quality		Low Quality	
	Bedencic,K., 2016	Tetreault,M.W., 2014	Ghanem, E., 2007	Burnett,R.S., 2010
Knee Diagnosis Accuracy				
False negative PJI			●	●
Hip/Knee Diagnosis Accuracy				
Culture positive in samples taken before vs after antibiotic prophylaxis	●			
concordance of intraop cultures with preop cultures in patients who had cultures taken before antibiotic prophylaxis, relative to culture concordance in those who had cultures taken after antibiotics were given.		●		

Figure 56: Summary of Findings: Use of Antibiotic Prophylaxis in Revision Surgery after Diagnosis Has Been Established(Efficacy in Preventing Future Infection).

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Moderate Quality	
	Carlsson,A.K., 1977	Hill,C., 1981 /Doyon,F., 1987
Hip Complications		
deep infection	↑	↑

Table 141: Antibiotics when diagnosis has already been established

Author	quality	N	Patient Population	Reference Standard	False Negatives	statistics	Significance
Ghanem, E., 2007	Low	171	knee patients undergoing revision for infection in whom infecting organism had been isolated from preoperative joint aspirate	Aspiration culture on solid media, or on liquid media if intraoperative culture positive, if CRP, ESR, and aspirate leukocyte cell count and/or neutrophil percentage were elevated in presence of intraoperative purulent material	Antibiotics: 12.5% No antibiotics: 8.1%	1.55(0.63,3.81)	NS
Burnett,R.S., 2010	Low	26	knee patients undergoing revision for infection and a known infecting organism. Excluded those who received antibiotic treatments within 4 weeks of surgery	Organisms cultured before antibiotics were given in OR	0 false negatives. All organisms cultured pre-antibiotic administration matched organisms cultured from intraop aspiration after antibiotics given	NA	NA
Bedencic,K., 2016	High Quality	40	enrolled hip/knee patients undergoing revision for suspected PJI with unknown microorganism. inclusion criteria: early loosening (10 years after primary implantation), positive synovial cytology results and negative microbiology results on preoperative aspiration (in this series, all aspirations performed yielded sufficient fluid on which to perform cultures), and any TKA or THA with no obvious mechanical reason for failure: exclusion criteria:antimicrobial therapy less than 14 days before surgery	One or more positive cultures.	Unclear	Odds of positive cultures before vs after antibiotic administration in patients undergoing revision for PJI=.99(.4,2.48)	NS

Author	quality	N	Patient Population	Reference Standard	False Negatives	statistics	Significance
Tetreault,M.W., 2014	High Quality	65	hip/knee patients who met MSIS criteria for infection undergoing revision. Excluded those with clinical evidence of infection but negative preoperative aspiration cultures and patients who received antibiotic therapy within 2 weeks of preop aspiration	Intraoperative cultures	Preop culture concordance rate: 82.4% in preop-antibiotic prophylaxis group; 80.6% in group getting antibiotics after cultures	Relative risk of intraoperative cultures matching preoperative cultures in PJI revision patients randomized to receive antibiotic prophylaxis before skin incision vs. patients receiving antibiotics after intraoperative cultures were obtained=1.02 (0.81, 1.29)	NS

Table 142: placebo vs antibiotic prophylaxis: prevention of PJI

Author	Antibiotic	Quality	N	Joint	Duration (years)	Statistic#	Result	Number Needed to Treat
Carlsson,A.K., 1977	Cloxacillin	Moderate Quality	171	Hip	1 to 2.5	RD= 12.07%(3.50,22.88)	PJI risk is greater in the placebo group than the antibiotic group	9
Carlsson,A.K., 1977	Cloxacillin	Moderate Quality	118	Hip	Between 5 and 6.6	RR=7.2 (1.7, 30.5)	PJI risk is greater in the placebo group than the antibiotic group	5
Hill,C., 1981	Cefazolin	Moderate Quality	2137	Hip	3	RR=3.51 (1.75, 7.05)	PJI risk is greater in the placebo group than the antibiotic group	43
Doyon,F., 1987*	Cefazolin	Moderate Quality	1069	Hip	5	Log rank p value=<.001(higher risk of infection in placebo group)	PJI risk is greater in the placebo group than the antibiotic group	unclear

*The Doyon article is a later follow up of the patients in the Hill article.

Risk Ratios(RR) >1 indicates higher risk of PJI in the placebo group. Risk Differences(RD) > 0 indicates higher risk of PJI in the Placebo group

AVOIDING INITIATING ANTIBIOTICS PRIOR TO OBTAINING INTRA-ARTICULAR CULTURES IN CASES OF SUSPECTED PJI SECTION

Quality Evaluation Table 12: Avoiding initiating antibiotics prior to obtaining intra-articular cultures in cases of suspected PJI

Study	Representative Population	Clear Selection Criteria	Detailed Enough to Replicate	Reference Standard Identifies Target Condition	Blinding	Other Bias?	Inclusion	Strength
Trampuz, A., 2007	●	◑	●	●	◑	●	Include	Moderate Quality
Shahi,A., 2016	●	◑	●	○	◑	◑	Include	Low Quality

Figure 57: Summary of Findings: Avoiding initiating antibiotics prior to obtaining intra-articular cultures in cases of suspected PJI

↑ **Less False Negatives**
↓ **More False Negatives**
● **Not Significant**

	Trampuz, A., 2007 Moderate Quality	Shahi,A., 2016 Low Quality
Hip/Knee Diagnosis Accuracy		
False negative PJI	↓	●

Table 143: Avoiding initiating antibiotics prior to obtaining intra-articular cultures in cases of suspected PJI: data table

Author	**Quality of evidence**	**N**	**Joint**	**Reference Standard**	**False Negatives**	**Statistic/result**	**Significance**
Trampuz, A., 2007	Moderate	79	Hip/knee	At least 1 of: 1)visible purulence of synovial fluid or area surrounding the prosthesis 2)acute inflammation on histopathologic exam of permanent periprosthetic tissue sections 3)a sinus tract communicating withthe prosthesis	Antibiotics within 14 days: 55%;No antibiotics within 14 days: 23%	RR=2.38(1.26,4.51)	Receiving antibiotics within 2 weeks of culture increased risk of negative results
Shahi,A.,2016	Low	106	Hip/knee	International Consensus Meeting criteria	Antibiotics within 2 weeks:30%; no antibiotics within 2 weeks(33%)	OR=0.87(0.35,2.18)	NS

CHOICE OF ANTIBIOTIC PROPHYLAXIS SECTION

Quality Evaluation Table 13 Antibiotic Choice- RCTs

Study	Random Sequence Generation	Allocation Concealment	Blinding	Incomplete Outcome Data	Selective Reporting	Other Bias	Is there a large magnitude of effect?	Influence of All Plausible Residual Confounding	Dose-Response Gradient	Inclusion	Strength
Bryan,C.S., 1988	●	●	●	◑	◑	●	●	●	●	Include	High Quality
Chareancholvanich,K., 2012	●	○	◑	◑	◑	●	●	●	●	Include	Moderate Quality
DeBenedictis,K.J., 1984	◑	○	●	◑	●	○	●	●	●	Include	Moderate Quality
Josefsson,G., 1993	◑	◑	◑	○	○	◑	●	●	●	Include	Low Quality
Periti,P., 1999	◑	◑	◑	◑	◑	◑	●	●	●	Include	Moderate Quality
Soave,R., 1986	◑	●	◑	◑	●	◑	●	●	●	Include	Moderate Quality
Soriano,A., 2008	◑	◑	●	●	●	●	●	●	●	Include	High Quality
Suter,F., 1994	●	◑	◑	●	●	●	●	●	●	Include	High Quality
Tyllianakis,M.E., 2010	○	○	○	●	○	◑	●	●	●	Include	Low Quality
Wall,R., 1988	◑	◑	○	●	●	○	●	●	●	Include	Moderate Quality

Quality Evaluation Table 14 Antibiotic Choice- Observational Studies

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Robertsson,O., 2017	◑	●	◑	●	◑	◑	Include	Low Quality
Soriano,A., 2008	◑	●	●	●	○	○	Include	Low Quality
Wu,C.T., 2016	◑	●	◑	●	◑	○	Include	Low Quality

Figure 58: antibiotic choice part 1- 2nd generation cephalosporin vs. 1st generation cephalosporin Summary of Findings

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	High Quality	Moderate Quality	
	Bryan,C.S., 1988	DeBenedictis,K.J., 1984	Soave,R., 1986
Complications: Hip/Knee Combined			
Infection(deep wound)	●		
Infection(PJI)		●	●

Figure 59: antibiotic choice part 2- 2nd generation cephalosporin vs. epoxide Summary of Findings

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Chareancholvanich,K., 2012 Moderate Quality
Complications: Knee	
Infection(deep)	●

Figure 60: antibiotic choice part 3- 2nd generation cephalosporin vs. fusidic acid Summary of Findings

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Low Quality** **Tyllianakis,M.E., 2010**
Complications: Hip/Knee Combined	
Infection(overall deep wound infections)	●
Infection(late deep wound infection between 30 days and 5 years post op)	●
Infection(early deep wound infection)	●

Figure 61: antibiotic choice part 4- 2nd generation cephalosporin vs. glycopeptide Summary of Findings

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	High Quality Suter,F., 1994	Moderate Quality Wall,R., 1988	Low Quality Tyllianakis,M.E., 2010
Complications: Hip/Knee Combined			
Infection(overall deep wound infections)			●
Infection(late deep wound infection between 30 days and 5 years post op)			●
Infection(early deep wound infection)			●
Cl. difficile-associated diarrhoea		●	
Complications: Hip			
Serous non-infected exudate	●		
Non-infected haematoma	●		
wound erythema	●		
Infected superficial haematoma	●		
deep infection	●		

Figure 62: antibiotic choice part 5- fusidic acid vs. glycopeptide Summary of Findings

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Low Quality** **Tyllianakis,M.E., 2010**
Complications: Hip/Knee Combined	
Infection(overall deep wound infections)	●
Infection(late deep wound infection between 30 days and 5 years post op)	●
Infection(early deep wound infection)	●

Figure 63: antibiotic choice part 6- glycopeptide vs. 1st generation cephalosporin Summary of Findings

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Periti,P., 1999 Moderate Quality
Complications: Hip/Knee Combined	
Infection(deep wound)	●

Figure 64: antibiotic choice part 7- lincosamides vs. penicillinase resistant penicillins Summary of Findings

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Robertsson,O., 2017** **Low Quality**
Reoperation: Knee	
revision for infection	↓

Figure 65: antibiotic choice part 8- timing Summary of Findings

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**High Quality** **Soriano,A., 2008**	**Low Quality** **Wu,C.T., 2016**
Complications: Knee		
Infection(deep tissue)	●	
Infection(deep implant)		●

Table 144: antibiotic choice part 1- 2nd generation cephalosporin vs. 1st generation cephalosporin: Complications(Hip/Knee Combined)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Bryan,C.S., 1988	High Quality	Infection(deep wound)	3.9 years	2 g of cefamandole before surgery followed by 1g every eight hours for six dose	49	0.00%	1g of cefazolin before surgery followed by 500 mg every eight hours for six doses	48	0.00%	RD	0(-7.41,7.27)	Not Significant (P-value>.05)
DeBenedictis,K.J., 1984	Moderate Quality	Infection(PJI)	1 years	THA or TKA with 1 g of cefonicid administered im or iv 30	37	0.00%	THA or TKA with 1g of cefazolin 30 before incision and every 8 hr for 72 hours post surgery	39	0.00%	RD	0(-8.967,9.406)	Not Significant (P-value>.05)
Soave,R., 1986	Moderate Quality	Infection(PJI)	Post-Op	Cephalothin (2 gm preoperatively, 2 gm intraoperati vely after blood and bone specimens were obtained, and 1 gm every six hours for three additional doses)	50	0.00%	ceforanide(gm preoperatively and 1 gm 12 hours later)	51	0.00%	RD	0(-7.005,7.135)	Not Significant (P-value>.05)

Table 145: antibiotic choice part 2- 2nd generation cephalosporin vs. Epoxide: Complications(Knee)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Chareancholvanich,K., 2012	Moderate Quality	Infection(deep)	5.9 months	three intravenous bolus doses of cefuroxime were given intravenously. The 1st dose, 1.5 grams of cefuroxime, was given to the patient at one hour before skin incision. The 2nd dose, 750 milligrams of cefuroxime, was given at the 8th hour and the 3rd dose, 750 milligrams of cefuroxime, was given to the patient at 16th hour after the first dose)	56	0.00%	2 doses of 2 grams of fosfomycin by 15 minute intravenous dripping. The 1st dose was given at one hour before skin incision and the 2nd dose was given at 12th hour after the first dose	56	0.00%	RD	0(-6.419,6.419)	Not Significant (P-value>.05)

Table 146: antibiotic choice part 3- 2nd generation cephalosporin vs. fusidic acid: Complications(Hip/Knee Combined)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Tyllianakis,M.E., 2010	Low Quality	Infection(overall deep wound infections)	Post-Op	primary THA or TKA with IV cefuroxime, 1.5g, 45 minutes before wound incision and 2 doses of 750 mg 8 and 16 hours postoperatively	188	0.53%	primary THA or TKA with iv 500 mg of fusidic acid 1 hour before wound incision and 2 doses 8 and 16 hours postoperatively	118	0.00%	RD	0.532(-2.651,2.951)	Not Significant (P-value>.05)
Tyllianakis,M.E., 2010	Low Quality	Infection(late deep wound infection between 30 days and 5 years post op)	Post-Op	primary THA or TKA with IV cefuroxime, 1.5g, 45 minutes before wound incision and 2 doses of 750 mg 8 and 16 hours postoperatively	188	0.00%	primary THA or TKA with iv 500 mg of fusidic acid 1 hour before wound incision and 2 doses 8 and 16 hours postoperatively	118	0.00%	RD	0(-3.153,2.002)	Not Significant (P-value>.05)
Tyllianakis,M.E., 2010	Low Quality	Infection(early deep wound infection)	1 months	primary THA or TKA with IV cefuroxime, 1.5g, 45 minutes before wound incision and 2 doses of 750 mg 8 and 16 hours postoperatively	188	0.53%	primary THA or TKA with iv 500 mg of fusidic acid 1 hour before wound incision and 2 doses 8 and 16 hours postoperatively	118	0.00%	RD	0.532(-2.651,2.951)	Not Significant (P-value>.05)

Table 147: antibiotic choice part 4- 2nd generation cephalosporin vs. glycopeptide: Complications(Hip/Knee Combined)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Suter,F., 1994	High Quality	Serous non-infected exudate	Post-Op	THA with cefamandole IV 2 doses (2 g before and 1 g after surgery)	246	0%	THA with teicoplanin (1 iv dose of 400 mg)	250	0.4%	RD	-0.4(-2.231,1.172)	Not Significant (P-value>.05)
Suter,F., 1994	High Quality	Non-infected haematoma	Post-Op	THA with cefamandole IV 2 doses (2 g before and 1 g after surgery)	246	1.63%	THA with teicoplanin (1 iv dose of 400 mg)	250	3.25%	RR	.51(.16,1.67)	Not Significant (P-value>.05)
Suter,F., 1994	High Quality	wound erythema	Post-Op	THA with cefamandole IV 2 doses (2 g before and 1 g after surgery)	246	1.22%	THA with teicoplanin (1 iv dose of 400 mg)	250	1.6%	RR	.76(.17,3.37)	Not Significant (P-value>.05)
Suter,F., 1994	High Quality	Infected superficial haematoma	Post-Op	THA with cefamandole IV 2 doses (2 g before and 1 g after surgery)	246	1.63%	THA with teicoplanin (1 iv dose of 400 mg)	250	0%	RD	1.626(-0.183,4.105)	Not Significant (P-value>.05)
Suter,F., 1994	High Quality	deep infection	Post-Op	THA with cefamandole IV 2 doses (2 g before and 1 g after surgery)	246	0%	THA with teicoplanin (1 iv dose of 400 mg)	250	0%	RD	0(-1.513,1.538)	Not Significant (P-value>.05)
Tyllianakis,M.E., 2010	Low Quality	Infection(late deep wound infection between 30 days and 5 years post op)	Post-Op	primary THA or TKA with IV cefuroxime, 1.5g, 45 minutes before wound incision and 2 doses of 750 mg 8 and 16 hours postoperatively	188	0.00%	primary THA or TKA with . Iv 1 g of vancomycin 1 hour before wound incision and 2 doses 12 and 24 hours postoperatively	129	0.78%	RD	-0.775(-4.26,1.326)	Not Significant (P-value>.05)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Tyllianakis,M.E., 2010	Low Quality	Infection(overall deep wound infections)	Post-Op	primary THA or TKA with IV cefuroxime, 1.5g, 45 minutes before wound incision and 2 doses of 750 mg 8 and 16 hours postoperatively	188	0.53%	primary THA or TKA with . Iv 1 g of vancomycin 1 hour before wound incision and 2 doses 12 and 24 hours postoperatively	129	0.78%	RR	0.69(0.04,10.87)	Not Significant (P-value>.05)
Tyllianakis,M.E., 2010	Low Quality	Infection(early deep wound infection)	1 months	primary THA or TKA with IV cefuroxime, 1.5g, 45 minutes before wound incision and 2 doses of 750 mg 8 and 16 hours postoperatively	188	0.53%	primary THA or TKA with . Iv 1 g of vancomycin 1 hour before wound incision and 2 doses 12 and 24 hours postoperatively	129	0.00%	RD	0.532(-2.393,2.951)	Not Significant (P-value>.05)
Wall,R., 1988	Moderate Quality	Other adverse event(Cl. difficile-associated diarrhoea)	1.4 weeks	TKA or THA with cefuroxime 750 mg iv with pre-medication, ceruroxime 750 mg iv al induction, and ceruroxime 750 mg iv 8 h post-operation	74	0.00%	TKA or THA with teicoplanin 400 mg iv with induction of anaesthesia	72	0.00%	RD	0(-5.065,4.935)	Not Significant (P-value>.05)

Table 148: antibiotic choice part 5- fusidic acid vs. glycopeptide: Complications(Hip/Knee Combined)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Tyllianakis,M.E., 2010	Low Quality	Infection(overall deep wound infections)	Post-Op	primary THA or TKA with iv 500 mg of fusidic acid 1 hour before wound incision and 2 doses 8 and 16 hours postoperatively	118	0.00%	primary THA or TKA with . Iv 1 g of vancomycin 1 hour before wound incision and 2 doses 12 and 24 hours postoperatively	129	0.78%	RD	-0.775(-4.26,2.442)	Not Significant (P-value>.05)
Tyllianakis,M.E., 2010	Low Quality	Infection(late deep wound infection between 30 days and 5 years post op)	Post-Op	primary THA or TKA with iv 500 mg of fusidic acid 1 hour before wound incision and 2 doses 8 and 16 hours postoperatively	118	0.00%	primary THA or TKA with . Iv 1 g of vancomycin 1 hour before wound incision and 2 doses 12 and 24 hours postoperatively	129	0.78%	RD	-0.775(-4.26,2.442)	Not Significant (P-value>.05)
Tyllianakis,M.E., 2010	Low Quality	Infection(early deep wound infection)	1 months	primary THA or TKA with iv 500 mg of fusidic acid 1 hour before wound incision and 2 doses 8 and 16 hours postoperatively	118	0.00%	primary THA or TKA with . Iv 1 g of vancomycin 1 hour before wound incision and 2 doses 12 and 24 hours postoperatively	129	0.00%	RD	0(-2.892,3.153)	Not Significant (P-value>.05)

Table 149: antibiotic choice part 6- glycopeptide vs. 1st generation cephalosporin: Complications(Hip/Knee Combined)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Periti,P., 1999	Moderate Quality	Infection(deep wound)	3 months	400 mg i.v. bolus of teicoplanin at induction of anesthesia	364	0.82%	received a 2 g i.v. bolus of cefazolin at induction and a 1 g i.v. bolus of cefazolin at 6, 12, 18, and 24 h postoperatively	375	0.80%	RR	1.03(0.21,5.07)	Not Significant (P-value>.05)
Periti,P., 1999	Moderate Quality	Infection(deep wound)	1 years	400 mg i.v. bolus of teicoplanin at induction of anesthesia	343	0.29%	received a 2 g i.v. bolus of cefazolin at induction and a 1 g i.v. bolus of cefazolin at 6, 12, 18, and 24 h postoperatively	340	0.29%	RR	0.99(0.06,15.78)	Not Significant (P-value>.05)

Table 150: antibiotic choice part 7- lincosamides vs. penicillinase resistant penicillins: Reoperation(Knee)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Robertsson,O., 2017	Low Quality	revision for infection	7 years	clindamycin	72232		cloxacillin	5771		hazard ratio	1.5(1.2–2.0)	Treatment 2

Table 151: antibiotic choice part 8- timing: Complications(Knee)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Soriano,A., 2008	High Quality	Infection(deep tissue)	3 months	Primary TKA recieving 1.5 g of cefuroxime 10–30 min before inflation of the tourniquet	442	3.39%	Primary TKA recieving 1.5 g of cefuroxime 10 min before release of the tourniquet	466	1.93%	RR	1.76(0.78,3.97)	Not Significant (P-value>.05)
Soriano,A., 2008	High Quality	Infection(deep tissue)	1 years	Primary TKA recieving 1.5 g of cefuroxime 10–30 min before inflation of the tourniquet	442	3.62%	Primary TKA recieving 1.5 g of cefuroxime 10 min before release of the tourniquet	466	2.58%	RR	1.41(0.67,2.94)	Not Significant (P-value>.05)
Wu,C.T., 2016	Low Quality	Infection(deep implant)	1 years	cefazolin or clindamycin within 30 minutes of incision	.		cefazolin or clindamycin betwen 30 and 60 minutes of incision	.		logistic regression p value	p=.97	Not Significant (P-value>.05)

ANTIBIOTIC CEMENT SECTION

Quality Evaluation Table 15 Antibiotic Cement RCTs

Study	Random Sequence Generation	Allocation Concealment	Blinding	Incomplete Outcome Data	Selective Reporting	Other Bias	Is there a large magnitude of effect?	Influence of All Plausible Residual Confounding	Dose-Response Gradient	Inclusion	Strength
Chiu,F.Y., 2001	○	○	◐	●	●	●	●	●	●	Include	Moderate Quality
Chiu,F.Y., 2002	○	○	◐	●	○	●	●	●	●	Include	Moderate Quality
Chiu,F.Y., 2009	○	○	○	●	●	●	●	●	●	Include	Moderate Quality
Hinarejos,P., 2013	●	●	○	●	●	●	●	●	●	Include	High Quality
Josefsson,G., 1993	◐	◐	◐	○	○	◐	●	●	●	Include	Low Quality
McQueen,M.M., 1990	◐	◐	○	●	○	●	●	●	●	Include	Moderate Quality

Quality Evaluation Table 16 Antibiotic Cement Observational Studies

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Bohm,E., 2014	◐	●	◐	●	○	◐	Include	Low Quality
Chiu,F.Y., 2001	◐	●	●	●	○	○	Include	Low Quality
Chiu,F.Y., 2009	◐	●	●	●	○	○	Include	Low Quality
Dale,H., 2009	◐	◐	◐	●	○	◐	Include	Low Quality
Dale,H., 2012	●	◐	◐	●	○	●	Include	Low Quality

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Engesaeter,L.B., 2003	◑	●	◑	●	○	◑	Include	Low Quality
Engesaeter,L.B., 2006	◑	◑	◑	●	○	◑	Include	Low Quality
Espehaug,B., 1997	◑	●	◑	●	○	●	Include	Low Quality
Gandhi,R., 2009	●	●	◑	●	○	○	Include	Low Quality
Hinarejos,P., 2013	◑	●	◑	●	○	○	Include	Low Quality
Namba,R.S., 2009	●	●	◑	●	○	○	Include	Low Quality
Namba,R.S., 2013	◑	●	◑	●	◑	○	Include	Low Quality
Schrama,J.C., 2015	●	◑	●	●	○	◑	Include	Low Quality
Tayton,E.R., 2016	●	◑	◑	●	◑	○	Include	Low Quality
Wang,H., 2015	◑	◑	◑	●	◑	○	Include	Low Quality
Wu,C.T., 2016	◑	●	◑	●	◑	○	Include	Low Quality

Figure 66: Antibiotic Cement vs No Antibiotic Cement(knee)

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Hinarejos,P., 2013	Chiu,F.Y., 2002	Chiu,F.Y., 2001	Chiu,F.Y., 2009	Wu,C.T., 2016	Tayton,E.R., 2016	Wang,H., 2015	Bohm,E., 2014	Namba,R.S., 2013	Namba,R.S., 2009	Dowsey,M.M., 2009
	High Quality	Moderate Quality	Low Quality								
Knee Complications-erythromycin + colistin cement											
Infection(infection diagnosed but had negative cultures(Primary TKA patients))	●										
Infection(deep Polymicrobial(Primary TKA patients))	●										
Infection(deep monomicrobial Staphylococcus aureus(Primary TKA patients))	●										
Infection(deep monomicrobial Streptococcus species(Primary TKA patients))	●										
Infection(deep monomicrobial Gram-negative bacilli(Primary TKA patients))	●										
Infection(deep monomicrobial Coagulase-negative staphylococcus(Primary TKA patients))	↑										
Infection(deep monomicrobial Propionibacterium acnes(Primary TKA patients))	●										
Infection(overall deep infection(Primary TKA patients))	●										
Knee Complications-cefuroxime											
Infection(deep(Primary TKA patients))		↑									
Loosening(loosening of femoral component leading to component revision(Primary TKA patients))		●									
Infection(deep(Primary TKA Diabetic Patients))			↑								
Knee Complications-vancomycin											
Infection(deep)(in revision TKA patients)				↑							
Loosening(component loosening. outcome is risk difference with newcombe score confidence intervals(revision TKA))				●							
Knee Complications-various antibiotic types											
Infection (deep implant)					↑						
Knee Complications-cement(unspecified antibiotic)											
Infection (deep)									↓		
Infection (PJI)											●
Infection (infection within 6 months postoperatively)						↓					
Knee Complications-gentamicin cement											
Infection (deep)							●				
Knee Reoperation-cement(unspecified antibiotic)											
Revision (revision for all reasons)								●			
Knee Complications-commercially available antibiotic cement un USA											
Infection (deep)										↓	

Figure 67: Antibiotic Cement vs Systemic Antibiotics (1 hip and 1 hip/knee study)

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Moderate Quality McQueen,M.M.,1990	Low Quality Josefsson,G., 1993
Hip Complications-gentamicin vs systemic antibiotics		
Loosening(aseptic loosening of 1 or both components(THA))		↑
Hip/Knee Complications-cefuroxime in cement vs systemic cefuroxime		
Infection(deep hip or knee infection within 3 months)	●	
Infection(late deep hip or knee infection after 3 months)	●	

Figure 68: Antibiotic Cement vs No Antibiotic Cement(Hip)

	Low Quality							
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Schrama,J.C., 2015**	**Dale,H., 2012**	**Dale,H., 2009**	**Gandhi,R., 2009**	**Dowsey,M.M., 2008**	**Engesaeter,L.B., 2006**	**Engesaeter,L.B., 2003**	**Espehaug,B., 1997**
Hip Reoperation-cement(unspecified antibiotic)								
Infection (revision due to infection)	↑							
Infection (revision for infection)		↑						
Revision (revision for infection)			↑					
Revision (overall revision)						↑		
Loosening (reoperation for aseptic loosening)						↑		
Hip Reoperation-cement(unspecified antibiotic) vs. uncemented								
Infection (revision for infection)						●		
Revision (revision for infection)			↑					
Revision (overall revision)						↑		
Loosening (reoperation for aseptic loosening)						↑		
Hip Complications-tombramycin cement								
Infection (deep)				●				
Hip Complications-cement(unspecified antibiotic)								
Infection (PJI)					●			
Hip Reoperation-gentamicin or erythromicin/colistin								
Infection (revision for infection)								↑
Revision (overall revision)								↑
Revision (for all reasons)							↑	
Loosening (revision for aseptic loosening)							↑	↑
Infection (revision for infection at 6 or more years after surgery)							↑	

Table 152: Knee RCT results

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Hinarejos,P., 2013	High Quality	Infection(infection diagnosed but had negative cultures(Primary TKA patients))	Post-Op	TKA with Simplex P cement loaded with 0.5 g of erythromycin and threemillion units of colistin in 40 g of cement	1483	0.07%	TKA with Simplex P cement	1465	0.00%	RD	0.067(-0.2,0.381)	Not Significant (P-value>.05)
Hinarejos,P., 2013	High Quality	Infection(deep Polymicrobial(Primary TKA patients))	Post-Op	TKA with Simplex P cement loaded with 0.5 g of erythromycin and threemillion units of colistin in 40 g of cement	1483	0.61%	TKA with Simplex P cement	1465	0.27%	RR	2.22(0.69,7.20)	Not Significant (P-value>.05)
Hinarejos,P., 2013	High Quality	Infection(deep monomicrobial Staphylococcus aureus(Primary TKA patients))	Post-Op	TKA with Simplex P cement loaded with 0.5 g of erythromycin and threemillion units of colistin in 40 g of cement	1483	0.34%	TKA with Simplex P cement	1465	0.34%	RR	0.99(0.29,3.41)	Not Significant (P-value>.05)
Hinarejos,P., 2013	High Quality	Infection(deep monomicrobial Streptococcus species(Primary TKA patients))	Post-Op	TKA with Simplex P cement loaded with 0.5 g of erythromycin and threemillion units of colistin in 40 g of cement	1483	0.07%	TKA with Simplex P cement	1465	0.00%	RD	0.067(-0.2,0.381)	Not Significant (P-value>.05)
Hinarejos,P., 2013	High Quality	Infection(deep monomicrobial Gram-negative bacilli(Primary TKA patients))	Post-Op	TKA with Simplex P cement loaded with 0.5 g of erythromycin and threemillion units of colistin in 40 g of cement	1483	0.20%	TKA with Simplex P cement	1465	0.14%	RR	1.48(0.25,8.86)	Not Significant (P-value>.05)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Hinarejos,P., 2013	High Quality	Infection(deep monomicrobial Coagulase-negative staphylococcus(Primary TKA patients))	Post-Op	TKA with Simplex P cement loaded with 0.5 g of erythromycin and threemillion units of colistin in 40 g of cement	1483	0.00%	TKA with Simplex P cement	1465	0.48%	RD	-0.478(-0.983,-0.121)	**Treatment 1 Significant (P-value<.05)**
Hinarejos,P., 2013	High Quality	Infection(deep monomicrobial Propionibacterium acnes(Primary TKA patients))	Post-Op	TKA with Simplex P cement loaded with 0.5 g of erythromycin and threemillion units of colistin in 40 g of cement	1483	0.07%	TKA with Simplex P cement	1465	0.14%	RR	0.49(0.04,5.44)	Not Significant (P-value>.05)
Hinarejos,P., 2013	High Quality	Infection(deep(Primary TKA patients))	Post-Op	TKA with Simplex P cement loaded with 0.5 g of erythromycin and threemillion units of colistin in 40 g of cement	1483	1.35%	TKA with Simplex P cement	1465	1.37%	RR	0.99(0.53,1.83)	Not Significant (P-value>.05)
Chiu,F.Y., 2002	Moderate Quality	Infection(deep(Primary TKA patients))	Post-Op	primary tka with tibial and patellar components getting cement impregnated with 2 g of cefuroxime in 40 g of Simplex P cement	178	0.00%	primary tka with tibial and patellar components getting plain cement	162	3.09%	RD	-3.086(-7.021,-0.336)	**Treatment 1 Significant (P-value<.05)**
Chiu,F.Y., 2002	Moderate Quality	Loosening(loosening of femoral component leading to component revision(Primary TKA patients))	2 years	primary tka with tibial and patellar components getting cement impregnated with 2 g of cefuroxime in 40 g of Simplex P cement	178	0.56%	primary tka with tibial and patellar components getting plain cement	162	0.00%	RD	0.562(-1.8,3.113)	Not Significant (P-value>.05)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Chiu,F.Y., 2001	Low Quality	Infection(deep(Primary TKA Diabetic Patients))	Post-Op	TKA with patellar and tibial components cemented with 2 g of cefuroxime in 40 g of Simplex P cement	41	0.00%	TKA with patellar and tibial components cemented with plain cement	37	13.51%	RD	-13.514(-27.977,-2.0)	**Treatment 1 Significant (P-value<.05)**
Chiu,F.Y., 2009	Low Quality	Infection(deep(revision TKA))	Post-Op	revision TKA with 1 g of vancomycin in 40 g of Simplex-P cement. none were determined to have infection at revision	93	0.00%	revision TKA. none were determined to have infection at revision	90	6.67%	RD	-6.667(-13.79,-1.326)	**Treatment 1 Significant (P-value<.05)**
Chiu,F.Y., 2009	Low Quality	Loosening(component loosening. outcome is risk difference with newcombe score confidence intervals(revision TKA))	Post-Op	revision TKA with 1 g of vancomycin in 40 g of Simplex-P cement. none were determined to have infection at revision	93	0.00%	revision TKA. none were determined to have infection at revision	90	0.00%	RD	0(-4.094,3.967)	Not Significant (P-value>.05)

Table 153: Knee Observational Study Results

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Wu,C.T., 2016	Low Quality	Infection (deep implant)	1 Days	3152	Antibiotic cement (TKA for advance OA, RA or post traumatic arthritis)	patients with pre mixed or surgeon mixed antibiotic bone cement:59% with cefazolin, 29% vancomycin,1% gentamicin, 8% tobramycin, or 3% cefuroxime vs no antibiotic bone cement	Thrombocytopenia, timing of antibiotic prophylaxis within 30 minutes of surgery, antibiotic bone cement	logistic regression odds ratio(CI)	0.31 (0.13-0.76)	antibiotic cement lowered the odds of deep implant infection
Tayton,E.R., 2016	Low Quality	Infection (infection within 6 months postoperatively)	Post-Op	64566	Antibiotic cement (Primary TKA)	antibiotic bone cement vs no antibiotic bone cement	age, BMI, surgical helmet systems, laminar flow, antibiotic cement,gender, previous surgery	odds ratio(95% CI), p value	1.93 (1.19, 3.13), .0008	Use of an antibiotic bone cement is associated with infection 6 months postoperatively
Wang,H., 2015	Low Quality	Infection (deep)	1.7 weeks	2293	Antibiotic cement (primary TKA)	commercial antibiotic-loaded bone cement (0.5-0.8 g gentamicin/40 g) vs plain bone cment	height, weight, diagnosis(OA vs other), uni vs bilateral, operative time, antibiotic bone cement	logistic regression odds ratio	0.835 (0.104-6.713)	NS
Bohm,E., 2014	Low Quality	Revision (revision for all reasons)	2 Days	36681	Antibiotic cement (cemented TKAs)	simplex, palacos, or cmw cement with antibiotics vs same cements without antibiotics	diabetes, sex, age, Charlson comorbidity index score	hazard ratio(CI)	1.066 (0.90–1.27)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Namba,R.S., 2013	Low Quality	Infection (deep)	Post-Op	56216	Antibiotic cement (primary elective total knee arthroplasties registered in the total joint replacement registry)	antibiotic cement vs no use of antibiotic cement	age, sex, race, diabetes, bmi, ASA score, diagnosis, hospital and surgeon characteristics, bilateral surgery, anesthesia type, surgical exposure, antibiotic prophylaxis type	hazard ratio(CI)	1.53(1.18, 1.98)	antibiotic cement increased the risk of deep infection
Namba,R.S., 2009	Low Quality	Infection (deep)	Post-Op	22889	Antibiotic cement (cemented primary TKA)	use of antibiotic cement commercially available in the US vs plain cement	age, sex, primary diagnosis (osteoarthritis vs other), ASA score, diabetes, operative time, use of antibiotic cement	logistic regression odds ratio(CI)	1.7 (1.1-2.5)	antibiotic cement increased the risk of infection compared to plain cement
Namba,R.S., 2009	Low Quality	Infection (deep)	Post-Op	22889	Antibiotic cement (cemented primary TKA in diabetic patients)	use of antibiotic cement commercially available in the US vs plain cement	none	odds ratio(exact confidence intervals)	1.939(0.561,5.422)	NS
Dowsey,M.M., 2009	Low Quality	Infection (PJI)	1 Days	1214	Antibiotic cement (elective TKA)	antibiotic bone cement vs. no antibiotic bone cement	cardiovascular disease, diabetes, respiratory disease, smoking, obesity, Rheumatoid arhtritis, transfusion, drain tube, antibiotic cement, gender, age	logistic regression odds ratio(CI)	1.05(0.35–3.11)	NS

Table 154: Antibiotic Cement vs Systemic Antibiotics RCTs (1 hip study and 1 hip/knee study)

Reference Title	Quality	Outcome Details	Duration	Treatment 1 (Details)	Group1 N	Mean1/P1 (SD1)	Treatment 2 (Details)	Group2 N	Mean2/P2 (SD2)	effect measure	Result (95% CI)	Favored Treatment
Josefsson,G., 1993	Low Quality	Loosening(aseptic loosening of 1 or both components(THA))	Post-Op	Gentamycin bone cement as only prophylaxis	713	23.98%	Various systemic antibiotics only	707	29.00%	RR	0.83(0.69,0.98)	**Treatment 1 Significant (P-value<.05)**
McQueen,M.M.,1990	Moderate Quality	Infection(deep hip or knee infection within 3 months)	3 months	cefuroxime in cement	201	0.995%	systemic cefuroxime	200	1.00%	RR	1.00 (0.14, 6.99)	Not Significant (P-value>.05)
McQueen,M.M.,1990	Moderate Quality	Infection(late deep hip or knee infection after 3 months)	>3months	cefuroxime in cement	201	0.00%	systemic cefuroxime	200	0.00%	RD	0(-1.885,1.875)	Not Significant (P-value>.05)

Table 155: Hip Observational Study Results

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Schrama,J.C., 2015	Low Quality	Infection (revision due to infection)	Post-Op	390671	Antibiotic cement (primary THAs for OA or RA in Nordic Arthroplasty Register Association (NARA) registry)	cement without antibiotics vs antibiotic bone cement	age,sex,diagnosis, year of primary surgery (before or after 2001), fixation type	cox proportional hazard ratio(CI)	1.4(1.2–1.6)	antibiotics with cement resulted in lower risk of revision for infection
Dale,H., 2012	Low Quality	Infection (revision for infection)	Post-Op	113280	Antibiotic cement (primary THAs in Nordic Arthroplasty Register Association dataset)	cement with antibiotics vs cement without antibiotics	age, sex, diagnosis, prosthesis type, fixation type, cement type, cement with antibiotics	Hazard ratio(CI)	.67(.55–.76)	Cement without antibiotics increased risk of pji
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Antibiotic cement (Primary THAs in the Norwegian Arthroplasty Register)	uncemented THA vs antibiotic cement	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI) (p value)	1.4(1.0–1.8) (p=.03)	antibiotic cement resulted in lower risk of revision for infection than uncemented THA
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Antibiotic cement (Primary THAs in the Norwegian Arthroplasty Register)	plain cement vs antibiotic cement	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI)	1.9(1.5–2.3)	cement with antibiotics resulted in lower risk of revision for infection than cement w/o antibiotic

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Gandhi,R., 2009	Low Quality	Infection (deep)	1 Days	1625	Antibiotic cement (THA with a diagnosis of primary or secondary osteoarthritis or rheumatoid arthritis)	tombramycin antibiotic bone cement vs plain bone cement	antibiotic cement, age, sex, bmi, charlson index, education, preop womac score, Rheumatoid arthritis.	logistic regression odds ratio(CI)	1.1 (0.4,3.1)	NS
Dowsey,M.M., 2008	Low Quality	Infection (PJI)	1 Days	1207	Antibiotic cement (Primary elective THA)	antibiotic cement(type unclear) vs no antibiotic cement	none	odds ratio(exact confidence intervals)	0.655(0.237,1.755)	NS
Engesaeter,L.B., 2006	Low Quality	Revision (overall revision)	1.7 weeks	51016	Antibiotic cement (primary THAs performed because of idiopathic osteoarthritis of the hip, and prostheses where both the acetabular and the femoral component were either uncemented or cemented.)	cement with antibiotics vs cement without antibiotics	sex, age, systemic antibiotic prophylaxis, type of operating room, and duration of operation	hazard ratio(CI) antibiotic cement;hazard ratio(CI) plain cement	0.5(0.4–0.6);0.9(0.8–1.0)	risk of overall revision is lower with antibiotic cement than plain cement

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Engesaeter,L.B., 2006	Low Quality	Loosening (reoperation for aseptic loosening)	1.7 weeks	51016	Antibiotic cement (primary THAs performed because of idiopathic osteoarthritis of the hip, and prostheses where both the acetabular and the femoral component were either uncemented or cemented.)	cement with antibiotics vs cement without antibiotics	sex, age, systemic antibiotic prophylaxis, type of operating room, and duration of operation	hazard ratio(CI) antibiotic cement vs uncemented;hazard ratio(CI) plain cement vs uncemented. statistic=lack of overlaping confidence intervals	0.6(0.5–0.7);1.3(1.1–1.6)	risk of aseptic loosening is lower with antibiotic cement than plain cement
Engesaeter,L.B., 2006	Low Quality	Infection (revision for infection)	1.7 weeks	40743	Antibiotic cement (primary THAs performed because of idiopathic osteoarthritis of the hip, and prostheses where both the acetabular and the femoral component were either uncemented or cemented.)	cement with antibiotics vs uncemented	sex, age, systemic antibiotic prophylaxis, type of operating room, and duration of operation	hazard ratio(CI)	1.2(0.7–2.0)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Engesaeter,L.B., 2006	Low Quality	Loosening (reoperation for aseptic loosening)	1.7 weeks	40743	Antibiotic cement (primary THAs performed because of idiopathic osteoarthritis of the hip, and prostheses where both the acetabular and the femoral component were either uncemented or cemented.)	cement with antibiotics vs uncemented	sex, age, systemic antibiotic prophylaxis, type of operating room, and duration of operation	hazard ratio(CI)	0.6(0.5–0.7)	cement with antibiotics lowered risk of aseptic loosening compared to uncemented THA
Engesaeter,L.B., 2006	Low Quality	Revision (overall revision)	1.7 weeks	40743	Antibiotic cement (primary THAs performed because of idiopathic osteoarthritis of the hip, and prostheses where both the acetabular and the femoral component were either uncemented or cemented.)	cement with antibiotics vs uncemented	sex, age, systemic antibiotic prophylaxis, type of operating room, and duration of operation	hazard ratio(CI)	0.5(0.4–0.6)	cement with antibiotics decreases revision risk compared to uncemented

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Engesaeter,L.B., 2003	Low Quality	Revision (for all reasons)	1.4 weeks	21636	Antibiotic cement (THA for primary osteoarthritis using cemented implants with documented good results and high viscosity cement)	only systemic antibiotics vs. cement with either colistin and erythromycin or gentamycin + systemic antibiotics	gender, age, cement- and prosthesis-brand, type of operating room and duration of operation	hazard ratio(CI)	1.4(1.1–1.7)	overall revision risk was lower with systemic and cement antibiotics vs systemic alone
Engesaeter,L.B., 2003	Low Quality	Loosening (revision for aseptic loosening)	1.4 weeks	21636	Antibiotic cement (THA for primary osteoarthritis using cemented implants with documented good results and high viscosity cement)	only systemic antibiotics vs. cement with either colistin and erythromycin or gentamycin + systemic antibiotics	gender, age, cement- and prosthesis-brand, type of operating room and duration of operation	hazard ratio(CI)(p value)	1.3(1.0–1.7)(p=.02)	systemic+antibiotic cement was associated with lower risk of revision for loosening
Engesaeter,L.B., 2003	Low Quality	Infection (revision for infection at 6 or more years after surgery)	1.4 weeks	21636	Antibiotic cement (THA for primary osteoarthritis using cemented implants with documented good results and high viscosity cement)	only systemic antibiotics vs. cement with either colistin and erythromycin or gentamycin + systemic antibiotics	gender, age, cement- and prosthesis-brand, type of operating room and duration of operation	hazard ratio(CI)	1.8(1.1–3.0)	systemic+antibiotic cement was associated with lower risk of revision for infection

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Espehaug,B., 1997	Low Quality	Revision (overall revision)	5 Days	10905	Antibiotic cement (primary THA in Norwegian arthroplasty register)	systemetic antibiotics alone vs. antibiotic bone cement (gentamicin or erythromicin/colistin) and systemic antibiotics	gender, age, the brand of cement, the prosthesis, the type of operating theatre, the operating time	Hazard ratio(CI)	1.8 (1.3 to 2.7)	systemic+cement antibiotics decreased risk of revision compared to systemic only
Espehaug,B., 1997	Low Quality	Loosening (revision for aseptic loosening)	5 Days	10905	Antibiotic cement (primary THA in Norwegian arthroplasty register)	systemetic antibiotics alone vs. antibiotic bone cement (gentamicin or erythromicin/colistin) and systemic antibiotics	gender, age, the brand of cement, the prosthesis, the type of operating theatre, the operating time	Hazard ratio(CI)	1.8 (1.1 to 2.9)	systemic+cement antibiotics decreased risk of revision for asep. loosening compared to systemic only
Espehaug,B., 1997	Low Quality	Infection (revision for infection)	5 Days	10905	Antibiotic cement (primary THA in Norwegian arthroplasty register)	systemetic antibiotics alone vs. antibiotic bone cement (gentamicin or erythromicin/colistin) and systemic antibiotics	gender, age, the brand of cement, the prosthesis, the type of operating theatre, the operating time	Hazard ratio(CI)	4.3 (1.7 to 11)	systemic+cement antibiotics decreased risk of revision for infection compared to systemic only

MRSA AND STAPHYLOCOCCUS SCREENING AND DECOLONIZATION SECTION

Quality Evaluation Table 17 MRSA and Staphylococcus Screening and Decolonization RCTs

Study	Random Sequence Generation	Allocation Concealment	Blinding	Incomplete Outcome Data	Selective Reporting	Other Bias	Is there a large magnitude of effect?	Influence of All Plausible Residual Confounding	Dose-Response Gradient	Inclusion	Strength
Kapadia,B.H., 2016	●	◑	○	○	○	○	●	●	●	Include	Low Quality
Sousa,R.J., 2016	○	○	◑	○	●	○	●	●	●	Include	Low Quality

Quality Evaluation Table 18 MRSA and Staphylococcus Screening and Decolonization Observational Studies

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Kapadia,B.H., 2016	◑	◑	○	●	◑	●	Include	Low Quality
Kapadia,B.H., 2016	◑	●	○	●	◑	◑	Include	Low Quality
Sousa,R.J., 2016	◑	●	◑	●	◑	○	Include	Low Quality

Figure 69: Summary of Findings: screening and selective decolonization with 2% mupirocin nasal ointment vs. No screening and decolonization

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Low Quality** **Sousa,R.J., 2016**
Hip/Knee Combined Complications	
Infection(PJI)	●

Figure 70: Summary of Findings: universal chlorhexidine cloth decolonization

	Low Quality		
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Kapadia,B.H., 2016**	**Kapadia,B.H., 2016**	**Kapadia,B.H., 2016**
Hip/Knee Combined Complications			
Infection(PJI)	↑		
Knee Complications			
Infection(PJI)	●		
Infection(PJI(in subgroup of patients in high nhsn risk category))			↑
Infection(PJI(in subgroup of patients in medium nhsn risk category))			↑
Infection(PJI (in subgroup of patients in low nhsn risk category))			●
Hip Complications			
Infection(PJI)	●	●	
Infection(PJI(in subgroup of patients in low nhsn risk category))		●	
Infection(PJI(in subgroup of patients in high nhsn risk category))		●	

Table 156: screening and selective decolonization with 2% mupirocin nasal ointment vs. No screening and decolonization

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Sousa,R.J., 2016	Low Quality	Infection (PJI)	1 Days	228	MRSA and Staphylococcus aureus screening and decolonization (elective primary THA or TKA)	S Aureus carriers that were decolonized by being Instructed to apply a 2% mupirocin nasal ointment twice daily to both nares and to bathe with chlorhexidine soap daily for 5 days before surgery vs. S Aureus carriers not decolonised	randomized, but no control for potential imbalance cause by switching treatment groups	odds ratio(exact confidence intervals)	0.774(0.122,3.74)	NS

Table 157: universal chlorhexidine cloth decolonization

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kapadia,B.H., 2016	Low Quality	Infection (PJI)	1 Days	442	MRSA and Staphylococcus aureus screening and decolonization (primary or revision THA or TKA)	2% chlorhexidine gluconate cloths night before and morning of admission vs bathing in soap and water preadmission	randomized	odds ratio with exact confidence intervals	0.107(0.002,0.807)	chlorexidine cloths lowered the odds of pji
Kapadia,B.H., 2016	Low Quality	Infection (PJI)	1 Days	234	MRSA and Staphylococcus aureus screening and decolonization (primary TKA)	2% chlorhexidine gluconate cloths night before and morning of admission vs bathing in soap and water preadmission	randomized	% risk difference with newcombe score confidence intervals	-1.724(-6.069,1.667)	NS
Kapadia,B.H., 2016	Low Quality	Infection (PJI)	1 Days	208	MRSA and Staphylococcus aureus screening and decolonization (primary THA)	2% chlorhexidine gluconate cloths night before and morning of admission vs bathing in soap and water preadmission	randomized	% risk difference with newcombe score confidence intervals	-1.099(-5.965,2.206)	NS
Kapadia,B.H., 2016	Low Quality	Infection (PJI(in subgroup of patients in medium nhsn risk category))	1 Days	1620	MRSA and Staphylococcus aureus screening and decolonization (primary or revision TKA with medium National Healthcare Safety Network risk category)	2% chlorhexidine gluconate(500mg)-impregnated cloths (6 cloths evening before surgery and 6 morning of surgery applied to neck, abdomen, back, upper extremities, left/right lower extremities and surgical site) vs. standard in-hospital perioperative skin	stratified by National Healthcare Safety Network risk category	relative risk(CI)	0.12 (0.02, 0.89)	chlorexidine cloths lowered risk of pji in patients at medium risk category for pji

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kapadia,B.H., 2016	Low Quality	Infection (PJI(in subgroup of patients in high nhsn risk category))	1 Days	650	MRSA and Staphylococcus aureus screening and decolonization (primary or revision TKA with high National Healthcare Safety Network risk category)	2% chlorhexidine gluconate(500mg)-impregnated cloths (6 cloths evening before surgery and 6 morning of surgery applied to neck, abdomen, back, upper extremities, left/right lower extremities and surgical site) vs. standard in-hospital perioperative skin	stratified by National Healthcare Safety Network risk category	% risk difference with newcombe score confidence intervals	-3.455(-5.463,-0.755)	chlorhexidine cloths reduced the risk of pji
Kapadia,B.H., 2016	Low Quality	Infection (PJI (in subgroup of patients in low nhsn risk category))	1 Days	1447	MRSA and Staphylococcus aureus screening and decolonization (primary or revision TKA with low National Healthcare Safety Network risk category)	2% chlorhexidine gluconate(500mg)-impregnated cloths (6 cloths evening before surgery and 6 morning of surgery applied to neck, abdomen, back, upper extremities, left/right lower extremities and surgical site) vs. standard in-hospital perioperative skin	stratified by National Healthcare Safety Network risk category	odds ratio with exact confidence intervals	0.469(0.05,2.215)	NS
Kapadia,B.H., 2016	Low Quality	Infection (PJI)	1 Days	1368	MRSA and Staphylococcus aureus screening and decolonization (primary or revision THAs in medium infection risk category)	2% chlorhexidine gluconate-impregnated cloths (500 mg chlorhexidine gluconate per cloth) the evening before and morning of surgery vs. standard in-hospital perioperative preparation for disinfection	stratified using the National Healthcare Safety Network (NHSN) risk categories	odds ratio with exact confidence intervals	0.345(0.039,1.443)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Kapadia,B.H., 2016	Low Quality	Infection (PJI(in subgroup of patients in low nhsn risk category))	1 Days	2032	MRSA and Staphylococcus aureus screening and decolonization (primary or revision THAs in low infection risk category)	2% chlorhexidine gluconate-impregnated cloths (500 mg chlorhexidine gluconate per cloth) the evening before and morning of surgery vs. standard in-hospital perioperative preparation for disinfection	stratified using the National Healthcare Safety Network (NHSN) risk categories	odds ratio with exact confidence intervals	0.573(0.104,2.095)	NS
Kapadia,B.H., 2016	Low Quality	Infection (PJI(in subgroup of patients in high nhsn risk category))	1 Days	441	MRSA and Staphylococcus aureus screening and decolonization (primary or revision THAs in high infection risk category)	2% chlorhexidine gluconate-impregnated cloths (500 mg chlorhexidine gluconate per cloth) the evening before and morning of surgery vs. standard in-hospital perioperative preparation for disinfection	stratified using the National Healthcare Safety Network (NHSN) risk categories	odds ratio with exact confidence intervals	0.249(0.006,1.68)	NS

INTRAOPERATIVE TECHNICAL FACTORS SECTION

Quality Evaluation Table 19: Intraoperative Technical Factors- RCTs

Study	Random Sequence Generation	Allocation Concealment	Blinding	Incomplete Outcome Data	Selective Reporting	Other Bias	Is there a large magnitude of effect?	Influence of All Plausible Residual Confounding	Dose-Response Gradient	Inclusion	Strength
Assor,M., 2010	○	○	◑	◑	○	○	●	●	●	Include	Low Quality

Quality Evaluation Table 20: Intraoperative Technical Factors- Observational Studies

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Brown,N.M., 2012	◑	●	●	○	○	◑	Include	Low Quality
Frisch,N.B., 2017	●	●	◑	●	◑	◑	Include	Moderate Quality

Figure 71: Summary of Findings-anti-septic wash vs No antiseptic wash

	Frisch,N.B., 2017 (Moderate Quality)	Brown,N.M., 2012 (Low Quality)
Hip/Knee Combined Complications		
Infection(Deep surgical site infection)	●	
Infection(acute PJI within 3 months)		↑

↑ **Better Outcomes**
↓ **Worse Outcomes**
● **Not Significant**

Figure 72: Summary of Findings-antibiotic powder vs No antibiotic powder

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Assor,M., 2010 Low Quality**
Knee Complications	
Infection(deep)	●
Loosening()	●

Table 158: anti-septic wash vs No antiseptic wash

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Brown,N.M., 2012	Low Quality	Infection (acute PJI within 3 months)	3 Days	2540	Intraoperative Technical factor (primary hip or knee TJA)	Post-Betadine period vs Pre-Betadine period	none	chi-squared test	0.018	acute infection rates were lower in the post betadine period
Frisch,N.B., 2017	Moderate Quality	Infection (Deep surgical site infection)	Post-Op	664	Intraoperative Technical factor (THA and TKA)	chlorhexidine gluconate irrigation vs. saline	age, gender, bmi, surgery, transfusion included	odds ratio(95% CI), p value	.6 (.12, 3.0) p= .534	NS

Table 159: antibiotic powder vs No antibiotic powder

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Assor,M., 2010	Low Quality	Loosening	Post-Op	135	Intraoperative Technical factor (Uncemented TKAs)	1-2g vancomycin powder with few drops of physiologic serum vs no local anti-infection agent	randomized	% risk difference with newcombe score confidence intervals	0(-4.999,5.834)	NS
Assor,M., 2010	Low Quality	Infection (deep)	Post-Op	135	Intraoperative Technical factor (Uncemented TKAs)	1-2g vancomycin powder with few drops of physiologic serum vs no local anti-infection agent	randomized	% risk difference with newcombe score confidence intervals	-4.11(-11.4,2.32)	NS

PICO QUESTIONS IN WHICH NO RECOMMENDATION FOR OR AGAINST COULD BE MADE DUE TO LOW EVIDENCE STRENGTH OR CONFLICTING EVIDENCE

INTRAOPERATIVE ENVIRONMENTAL CONTROLS SECTION (NO RECOMMENDATION FOR OR AGAINST WAS ABLE TO BE MADE DUE LOW EVIDENCE STRENGTH AND CONFLICTING EVIDENCE).

Quality Evaluation Table 21: Intraoperative Environmental Controls RCTs

Study	Random Sequence Generation	Allocation Concealment	Blinding	Incomplete Outcome Data	Selective Reporting	Other Bias	Is there a large magnitude of effect?	Influence of All Plausible Residual Confounding	Dose-Response Gradient	Inclusion	Strength
Lidwell,O.M., 1982	◑	●	◑	○	●	○	●	●	●	Include	Moderate Quality

Quality Evaluation Table 22: Intraoperative Environmental Controls Observational Studies

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Dale,H., 2009	◑	◑	◑	●	○	◑	Include	Low Quality
Namba,R.S., 2013	◑	●	◑	●	◑	○	Include	Low Quality
Salvati,E.A., 1982	●	●	◑	●	○	○	Include	Low Quality
Song,K.H., 2012	●	●	◑	●	○	○	Include	Low Quality
Tayton,E.R., 2016	●	◑	◑	●	◑	○	Include	Low Quality

Figure 73: Summary of Findings-OR traffic control vs. No OR traffic control: less OR personnel vs more personal

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Salvati,E.A., 1982 Low Quality
Hip/Knee Combined Complications	
Infection(postoperative wound infection)	↑

Figure 74: Summary of Findings- Greenhouse ventilation vs. Ordinary Ventilation

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Dale,H., 2009 Low Quality
Hip Reoperation	
Revision(revision for infection)	●

Figure 75: Summary of Findings-laminar air flow vs. No laminar air flow

	Low Quality				
↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Song,K.H., 2012**	**Namba,R.S., 2013**	**Dale,H., 2009**	**Tayton,E.R., 2016**	**Salvati,E.A., 1982**
Hip/Knee Combined Complications					
Infection(deep incisional and/or organ space infection)	↑				
Knee Complications					
Infection(deep)		●			
Infection(deep incisional and/or organ space infection)	↑				
Infection(infection within 6 months postoperatively)				↓	
Infection(postoperative wound infection)					↓
Infection(infection within 12 months postoperatively)				↓	
Hip Complications					
Infection(postoperative wound infection)					●
Hip Reoperation					
Revision(revision for infection)			↓		

Figure 76: Summary of Findings-space suits vs. No space suits

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Namba,R.S., 2013 Low Quality
Knee Complications	
Infection(deep)	●

Figure 77: Summary of Findings-ultra clean air vs. No ultra clean air

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Lidwell,O.M., 1982 Moderate Quality
Hip/Knee Combined Complications	
Infection(Deep joint sepsis(DJS) within 2-2.5 years)	↑

Table 160: OR traffic control vs. No OR traffic control

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Salvati,E.A., 1982	Low Quality	Infection (postoperative wound infection)	Post-Op	3175	Intraoperative environmental control measures (Total hip and knee replacements)	number of operating room personal	none	correlation, p	.03, < .03	Number of operating room personnel showed significant correlation with postoperative infection rate

Table 161: Greenhouse ventilation vs. Ordinary Ventilation

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Intraoperative environmental control measures (Primary THAs in the Norwegian Arthroplasty Register)	greenhouse ventilation vs. ordinary ventilation	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI)	1.3(0.9–2.0)	NS

Table 162: laminar air flow vs. No laminar air flow

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Tayton,E.R., 2016	Low Quality	Infection (infection within 12 months postoperatively)	Post-Op	64566	Intraoperative environmental control measures (Primary TKA)	laminar air flow vs. no laminar air flow	age, BMI, surgical helmet systems, laminar flow, antibiotic cement,gender, previous surgery	odds ratio(95% CI), p value	1.42 (1.05, 1.90), .021	Use of laminar air flow is associated with infection 6 months postoperatively
Tayton,E.R., 2016	Low Quality	Infection (infection within 6 months postoperatively)	Post-Op	64566	Intraoperative environmental control measures (Primary TKA)	laminar air flow vs. no laminar air flow	age, BMI, surgical helmet systems, laminar flow, antibiotic cement,gender, previous surgery	odds ratio(95% CI), p value	1.6 (1.04, 2.47), .033	Use of laminar air flow is associated with infection 6 months postoperatively
Namba,R.S., 2013	Low Quality	Infection (deep)	Post-Op	56216	Intraoperative environmental control measures (primary elective total knee arthroplasties registered in the total joint replacement registry)	clean air vs no clean air	age, sex, race, diabetes, bmi, ASA score, diagnosis, hospital and surgeon characteristics, bilateral surgery, anesthesia type, surgical exposure, antibiotic prophylaxis type	hazard ratio(CI)	0.93(0.73, 1.18)	NS
Namba,R.S., 2013	Low Quality	Infection (deep)	Post-Op	56216	Intraoperative environmental control measures (primary elective total knee arthroplasties registered in the total joint replacement registry)	laminar flow vs no laminar flow	age, sex, race, diabetes, bmi, ASA score, diagnosis, hospital and surgeon characteristics, bilateral surgery, anesthesia type, surgical exposure, antibiotic prophylaxis type	hazard ratio(CI)	0.91(0.71, 1.16)	NS

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Song,K.H., 2012	Low Quality	Infection (deep incisional and/or organ space infection)	Post-Op	6848	Intraoperative environmental control measures (THA or TKA combined)	HEPA filtered laminar flow vs no artificial ventilation	none	p value from logistic regression	0.47(0.26,0.83)	HEPA filtered laminar flow decreased risk of PJI
Song,K.H., 2012	Low Quality	Infection (deep incisional and/or organ space infection)	Post-Op	3426	Intraoperative environmental control measures (TKA)	HEPA filtered laminar flow vs no artificial ventilation	number of surgeon surgeries per mont, ventilation, sex, hospital stay, anesthesia, revision surgery, duration of surgery, infections at other anatomical sites	p value from logistic regression	.34(.18,.49)	HEPA filtered laminar flow decreased risk of PJI
Dale,H., 2009	Low Quality	Revision (revision for infection)	5 Days	97344	Intraoperative environmental control measures (Primary THAs in the Norwegian Arthroplasty Register)	laminar flow vs ordinary ventilation	sex,age, diagnosis, modular vs monoblock, duration of surgery, operation room ventilation type, systemic antibiotic prophylaxis, uncemented vs cement with antibiotics vs plain cemented	cox proportional hazard ratio(CI)	1.3(1.1–1.5)	laminar flow increased the risk of revision due to infection
Salvati,E.A., 1982	Low Quality	Infection (postoperative wound infection)	Post-Op	3175	Intraoperative environmental control measures (Total hip replacements)	laminar flow vs no laminar flow	stratified by joint type	risk ratio (CI)	0.64 (0.32, 1.24)	NS
Salvati,E.A., 1982	Low Quality	Infection (postoperative wound infection)	Post-Op	3175	Intraoperative environmental control measures (Total knee replacements)	laminar flow vs no laminar flow	stratified by joint type	risk ratio (CI)	2.77 (1.15, 6.71)	Laminar flow increased risk of PJI

Table 163: space suits vs. No space suits

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Namba,R.S., 2013	Low Quality	Infection (deep)	Post-Op	56216	Intraoperative environmental control measures (primary elective total knee arthroplasties registered in the total joint replacement registry)	body exhaust suits vs no body exhaust suits	age, sex, race, diabetes, bmi, ASA score, diagnosis, hospital and surgeon characteristics, bilateral surgery, anesthesia type, surgical exposure, antibiotic prophylaxis type	hazard ratio(CI)	0.87(0.68, 1.11)	NS

Table 164: ultra clean air vs. No ultra clean air

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lidwell,O.M., 1982	Moderate Quality	Infection (Deep joint sepsis(DJS) within 2-2.5 years)	2 Days	8055	Intraoperative environmental control measures (primary hip or knee TJA)	ultraclean vs control air overall hospitals	randomized	relative risk(CI)	2.6 (1.6-4.2)	ultraclean air conditions result in lower risk of PJI
Lidwell,O.M., 1982	Moderate Quality	Infection (Deep joint sepsis(DJS) within 2-2.5 years)	2 Days	4248	Intraoperative environmental control measures (primary hip or knee TJA)	ultra clean air vs no clean air (subgroup of hospitals that used conventional clothing)	randomized	relative risk(CI)	2 (1.1-3.6)	ultraclean air conditions that wore conventional clothing result in lower risk of PJI
Lidwell,O.M., 1982	Moderate Quality	Infection (Deep joint sepsis(DJS) within 2-2.5 years)	2 Days	4768	Intraoperative environmental control measures (primary hip or knee TJA)	ultra clean air vs no clean air(subgroup of hospitals using body exhaust suits or trexler isolaters)	randomized	relative risk(CI)	4.5 (1.8-11)	ultraclean air conditions that use body exhaust suits result in lower risk of PJI
Lidwell,O.M., 1982	Moderate Quality	Infection (Deep joint sepsis(DJS) within 2-2.5 years)	2 Days	2221	Intraoperative environmental control measures (primary hip or knee TJA)	ultra clean air vs no clean air (subgroup of patients Not given antibiotic prophylaxis)	randomized	relative risk(CI)	2.74 (1.47-5.10)	ultraclean air conditions not given antibiotic prophylaxis result in lower risk of PJI

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Lidwell,O.M., 1982	Moderate Quality	Infection (Deep joint sepsis(DJS) within 2-2.5 years)	2 Days	5831	Intraoperative environmental control measures (primary hip or knee TJA)	ultra clean air vs no clean air (subgroup of patients given antibiotic prophylaxis)	randomized	relative risk(CI)	2.32 (1.11-4.83)	ultraclean air conditions given antibiotic prophylaxis result in lower risk of PJI

POSTOPERATIVE PREVENTION TECHNIQUES

Quality Evaluation Table 23: Post-Op Prevention Techniques Observational Study Quality

Study	Representative Population	Reason for Follow Up Loss	Prognostic Factor Measured	Outcome Measurement	Confounders	Appropriate Statistical Analysis	Inclusion	Strength
Grosso,M.J., 2017	◑	●	◑	●	●	○	Include	Low Quality
Newman,J.T., 2011	◑	●	◑	●	○	◑	Include	Low Quality

Figure 78: Summary of Findings-silver impregnated dressing vs No silver impregnated dressing

↑ Better Outcomes ↓ Worse Outcomes ● Not Significant	Grosso,M.J., 2017 / Low Quality
Hip/Knee Combined Complications	
Infection(acute PJI within 3 months of surgery)	↑

Figure 79: Summary of Findings-sutures vs. staples

↑ **Better Outcomes** ↓ **Worse Outcomes** ● **Not Significant**	**Newman,J.T., 2011** **Low Quality**
Knee Complications	
Infection(organ space)	●
Infection(deep tissue or organ space infection)	●
Wound healing complication(Simple wound dehiscence)	●

Table 165: silver impregnated dressing vs No silver impregnated dressing

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Grosso,M.J., 2017	Low Quality	Infection (acute PJI within 3 months of surgery)	3 Days	1173	Postop Prevention techniques (primary hip or knee TJA)	Aquacel silver impregnated dressing vs. standard standard xeroform/gauze dressing	Aquacel dressing, age, gender, and BMI, hip vs knee surgery, evidence of superficial infection, other variables included in model are unclear due to incomplete results reporting	logistic regression odds ratio(CI)	0.092 (0.017-0.490)	silver impregnated dressing results in lower risk of PJI

Table 166: sutures vs. staples

Reference Title	Quality	Outcome Details	Duration	N	Treatment (Details)	Comparison	Confounding Adjustment	Statistic	Result	Significance
Newman,J.T., 2011	Low Quality	Infection (organ space)	Post-Op	181	Postop Prevention techniques (Primary TKA Patients)	subarticular sutures vs. staples	none	% risk difference with newcombe score confidence intervals	1.01(-3.542,5.502)	NS
Newman,J.T., 2011	Low Quality	Infection (deep tissue or organ space infection)	Post-Op	181	Postop Prevention techniques (Primary TKA Patients)	subarticular sutures vs. staples	none	% risk difference with newcombe score confidence intervals	2.02(-2.688,7.069)	NS
Newman,J.T., 2011	Low Quality	Wound healing complication (Simple wound dehiscence)	Post-Op	181	Postop Prevention techniques (Primary TKA Patients)	subarticular sutures vs. staples	none	% risk difference with newcombe score confidence intervals	3.03(-1.869,8.534)	NS

Excluded Literature

Article Title	Authors	Year	Expanded Periodical Title	Reason for Exclusion
Periprosthetic Joint Infections Caused by Enterococci Have Poor Outcomes	Kheir,M.M.; Tan,T.L.; Higuera,C.; George,J.; Della Valle,C.J.; Shen,M.; Parvizi,J.	2017	J.Arthroplasty	not relevant. was study of treatment outcomes of pji. also not all patients had revision arthroplasty
What Are the Frequency, Associated Factors, and Mortality of Amputation and Arthrodesis After a Failed Infected TKA?	Son,M.S.; Lau,E.; Parvizi,J.; Mont,M.A.; Bozic,K.J.; Kurtz,S.	2017	Clin.Orthop.Relat.Res.	inadequate data for pico question. article studies failed revision as a treatment for infection that leads to amputation or arthrodesis. They have to rely on the assumption that subsequent amputations or arthrodeses were from failed infection, since the diagnosis leading to the procedures weren't available in the claims dataset
Does Extracellular DNA Production Vary in Staphylococcal Biofilms Isolated From Infected Implants versus Controls?	Zatorska,B.; Groger,M.; Moser,D.; Diab-Elschahawi,M.; Lusignani,L.S.; Presterl,E.	2017	Clin.Orthop.Relat.Res.	inadequate quality due to spectrum bias
Intrawound Vancomycin Powder Reduces Early Prosthetic Joint Infections in Revision Hip and Knee Arthroplasty	Otte,J.E.; Politi,J.R.; Chambers,B.; Smith,C.A.	2017	Surg.Technol.Int.	Very low quality
Does laminar airflow make a difference to the infection rates for lower limb arthroplasty: a study using the National Joint Registry and local surgical site infection data for two hospitals with and without laminar airflow	Singh,S.; Reddy,S.; Shrivastava,R.	2017	Eur.J.Orthop.Surg.Traumatol.	Very low quality
Do zip-type skin-closing devices show better wound status compared to conventional staple devices in total knee arthroplasty?	Ko,J.H.; Yang,I.H.; Ko,M.S.; Kamolhuja,E.; Park,K.K.	2017	Int.Wound J.	Not relevant to criteria
Strategies to Prevent Periprosthetic Joint Infection After Total Knee Arthroplasty and Lessen the Risk of Readmission for the Patient	Iorio,R.; Osmani,F.A.	2017	J.Am.Acad.Orthop.Surg.	narrative review
Complications After Revision Total Hip Arthroplasty in the Medicare Population	Badarudeen,S.; Shu,A.C.; Ong,K.L.; Baykal,D.; Lau,E.;	2017	J.Arthroplasty	unclear if infection outcome is specifict to prosthetic joint infections

	Malkani,A.L.			
Periprosthetic Infection Recurrence After 2-Stage Exchange Arthroplasty: Failure or Fate?	Triantafyllopoulos,G.K.; Memtsoudis,S.G.; Zhang,W.; Ma,Y.; Sculco,T.P.; Poultsides,L.A.	2017	J.Arthroplasty	uninterpretable results. the logistic regression results in the table seem to imply that the variables were screened out of the stepwise model, but the text says the variables are statistically signficant.
Super Obesity Is an Independent Risk Factor for Complications After Primary Total Hip Arthroplasty	Werner,B.C.; Higgins,M.D.; Pehlivan,H.C.; Carothers,J.T.; Browne,J.A.	2017	J.Arthroplasty	unclear if infection outcome is specific to PJI
Effect of Hypoglycemia on the Incidence of Revision in Total Knee Arthroplasty	Roche,M.W.; Law,T.Y.; Triplet,J.J.; Hubbard,Z.S.; Kurowicki,J.; Rosas,S.	2017	J.Arthroplasty	not relevant to pico question because diabetic patients were excluded from study
Is There a Threshold Value of Hemoglobin A1c That Predicts Risk of Infection Following Primary Total Hip Arthroplasty?	Cancienne,J.M.; Werner,B.C.; Browne,J.A.	2017	J.Arthroplasty	the study group was comprised of patients who had a1c measurements taken either before or after surgery
Increased Risk of Revision, Reoperation, and Implant Constraint in TKA After Multiligament Knee Surgery	Pancio,S.I.; Sousa,P.L.; Krych,A.J.; Abdel,M.P.; Levy,B.A.; Dahm,D.L.; Stuart,M.J.	2017	Clin.Orthop.Relat.Res.	risk factor studies not relevant to pico questions
Repeat Two-Stage Exchange Arthroplasty for Periprosthetic Knee Infection Is Dependent on Host Grade	Fehring,K.A.; Abdel,M.P.; Ollivier,M.; Mabry,T.M.; Hanssen,A.D.	2017	J.Bone Joint Surg.Am.	quality was rated inadequate due to ungeneralizable patient population, no control for confounding, and the retrospective nature need to collect risk factor data.
Outcome analysis of hip or knee arthroplasty in patients with cirrhotic liver disease	Seol,Y.J.; Yoon,T.R.; Lee,D.H.; Lee,S.H.; Park,K.S.	2017	J.Orthop.	insufficient reporting of infection results
The Synergy cementless femoral stem in primary total hip arthroplasty at a minimum follow-up of 15 years	Martino,I.; Santis,V.; Apolito,R.; Sculco,P.K.; Cross,M.B.; Gasparini,G.	2017	Bone Joint J.	retrospective case series
What is the Diagnostic Accuracy of Aspirations Performed on Hips With Antibiotic Cement Spacers?	Newman,J.M.; George,J.; Klika,A.K.; Hatem,S.F.; Barsoum,W.K.; Trevor,North W.; Higuera,C.A.	2017	Clin.Orthop.Relat.Res.	evaluates diagnostic tests in patients that already had infected implant removed
The Mark Coventry, MD, Award: Oral Antibiotics Reduce Reinfection After Two-Stage Exchange: A Multicenter, Randomized Controlled Trial	Frank,J.M.; Kayupov,E.; Moric,M.; Segreti,J.; Hansen,E.; Hartman,C.; Okroj,K.; Belden,K.;	2017	Clin.Orthop.Relat.Res.	not relevant to pico question. antibiotics given post revision for infection, based on antibiotic sensitivity.

	Roslund,B.; Silibovsky,R.; Parvizi,J.; Della Valle,C.J.			
The John N. Insall Award: Do Intraarticular Injections Increase the Risk of Infection After TKA?	Bedard,N.A.; Pugely,A.J.; Elkins,J.M.; Duchman,K.R.; Westermann,R.W.; Liu,S.S.; Gao,Y.; Callaghan,J.J.	2017	Clin.Orthop.Relat.Res.	unclear if all patients had injections of hyaluronic acid and/or corticosteroids.
Elevated Body Mass Index Is Associated With Early Total Knee Revision for Infection	Electricwala,A.J.; Jethanandani,R.G.; Narkbunnam,R.; Huddleston,J.I.,III; Maloney,W.J.; Goodman,S.B.; Amanatullah,D.F.	2017	J.Arthroplasty	descriptive study of revision patients, that cannot adequately evaluate revision risk because no unrevised patients were included in the study
Visible glove perforation in total knee arthroplasty	Jid,L.Q.; Ping,M.W.; Chung,W.Y.; Leung,W.Y.	2017	J.Orthop.Surg.(Hong Kong)	for risk factor PICOS: no relevant risk factors for pji not examined. for intra-op environmental control PICO: does not evaluate efficacy of glove changes on preventing PJI, but rather evaluates glove perforation as a risk factor for PJI
Postoperative hyperglycaemia control reduces postoperative complications in patients subject to total knee arthroplasty	Reategui,D.; Tornero,E.; Popescu,D.; Sastre,S.; Camafort,M.; Gines,G.; Combalia,A.; Lozano,L.	2017	Knee	infection outcome not specific to PJI
Length of stay and short-term functional outcomes after total knee arthroplasty: Can we predict them?	Maiorano,E.; Bodini,B.D.; Cavaiani,F.; Pelosi,C.; Sansone,V.	2017	Knee	unclear if infection outcome is specific to PJI
Comparable outcomes after total knee arthroplasty in patients under 55 years than in older patients: a matched prospective study with minimum follow-up of 10 years	Lizaur-Utrilla,A.; Martinez-Mendez,D.; Miralles-Munoz,F.A.; Marco-Gomez,L.; Lopez-Prats,F.A.	2016	Knee Surg.Sports Traumatol.Arthrosc.	although well designed to evaluate risk factors for poor patient reported outcomes, the quality was inadequate for the deep infection outcome because the sample size was to small to detect any events in both age groups, which also would proclude any advanced statistical analysis on that outcome.
Does Barbed Suture Lower Cost and Improve Outcome in Total Knee Arthroplasty? A Randomized Controlled Trial	Chan,V.W.; Chan,P.K.; Chiu,K.Y.; Yan,C.H.; Ng,F.Y.	2016	J.Arthroplasty	Not relevant to criteria

Minimum 10-year results of cementless total hip arthroplasty in patients with rheumatoid arthritis	Haraguchi,A.; Nakashima,Y.; Miyahara,H.; Esaki,Y.; Okazaki,K.; Fukushi,J.I.; Hirata,G.; Ikemura,S.; Kamura,S.; Sakuraba,K.; Fujimura,K.; Akasaki,Y.; Yamada,H.	2016	Mod.Rheumatol.	doesn't study risk factors for pji
Operative Time Affects Short-Term Complications in Total Joint Arthroplasty	Duchman,K.R.; Pugely,A.J.; Martin,C.T.; Gao,Y.; Bedard,N.A.; Callaghan,J.J.	2016	J.Arthroplasty	wound complications not specific to pji
Antibiotics and antiseptics for preventing infection in people receiving revision total hip and knee prostheses: a systematic review of randomized controlled trials	Voigt,J.; Mosier,M.; Darouiche,R.	2016	BMC Infect.Dis.	systematic review
False-positive Cultures After Native Knee Aspiration: True or False	Jennings,J.M.; Dennis,D.A.; Kim,R.H.; Miner,T.M.; Yang,C.C.; McNabb,D.C.	2016	Clin.Orthop.Relat.Res.	not relevant. looks at infection in native knees
Polymerase Chain Reaction-Electrospray-Time-of-Flight Mass Spectrometry Versus Culture for Bacterial Detection in Septic Arthritis and Osteoarthritis	Palmer,M.P.; Melton-Kreft,R.; Nistico,L.; Hiller,N.L.; Kim,L.H.; Altman,G.T.; Altman,D.T.; Sotereanos,N.G.; Hu,F.Z.; De Meo,P.J.; Ehrlich,G.D.	2016	Genet.Test.Mol.Biomarkers	not relevant. evaluated septic arthritis in native knee joint
Topical use of topical fibrin sealant can reduce the need for transfusion, total blood loss and the volume of drainage in total knee and hip arthroplasty: A systematic review and meta-analysis of 1489 patients	Li,J.; Li,H.B.; Zhai,X.C.; Qin,Lei; Jiang,X.Q.; Zhang,Z.H.	2016	Int.J.Surg.	systematic review and doesn't anser pico question
Prior Staphylococcus Aureus Nasal Colonization: A Risk Factor for Surgical Site Infections Following Decolonization	Ramos,N.; Stachel,A.; Phillips,M.; Vigdorchik,J.; Slover,J.; Bosco,J.A.	2016	J.Am.Acad.Orthop.Surg.	not relevant comparison to pico question because all patients got screening and decolonization. study compares those with positive colonization to those with negative colonization prognostic factors
Do the biologic agents increase the risk of infection in patients undergoing lower limb arthroplasty surgery?	Sandiford,N.A.	2016	Curr Rheumatol.Rev.	systematic review

A Bundle Protocol to Reduce the Incidence of Periprosthetic Joint Infections After Total Joint Arthroplasty: A Single-Center Experience	Bullock,M.W.; Brown,M.L.; Bracey,D.N.; Langfitt,M.K.; Shields,J.S.; Lang,J.E.	2016	J.Arthroplasty	insufficient data to separate the effects of each infection control protocol to answer the PICO question, since multiple infection control measures were bundled together and compared to time period before bundle was implemented.
Use of a provincial surveillance system to characterize postoperative surgical site infections after primary hip and knee arthroplasty in Alberta, Canada	Rennert-May,E.; Bush,K.; Vickers,D.; Smith,S.	2016	Am.J.Infect.Control	not relevant comparison. looked at positive colonization as a risk factor, rather than comparing patients screened and decolonized to those not screened and decolonized.
The use of high-dose dual-impregnated antibiotic-laden cement with hemiarthroplasty for the treatment of a fracture of the hip: The Fractured Hip Infection trial	Sprowson,A.P.; Jensen,C.; Chambers,S.; Parsons,N.R.; Aradhyula,N.M.; Carluke,I.; Inman,D.; Reed,M.R.	2016	Bone Joint J.	patients did not get total joint replacement
Risk Factors for Wound Complications After Direct Anterior Approach Hip Arthroplasty	Jahng,K.H.; Bas,M.A.; Rodriguez,J.A.; Cooper,H.J.	2016	J.Arthroplasty	wound complication outcome not specific to PJI
Total Knee Arthroplasty in Obesity: In-Hospital Outcomes and National Trends	Woon,C.Y.; Piponov,H.; Schwartz,B.E.; Moretti,V.M.; Schraut,N.B.; Shah,R.R.; Goldstein,W.M.	2016	J.Arthroplasty	infection outcome not specific to pji
Simplified Frailty Index as a Predictor of Adverse Outcomes in Total Hip and Knee Arthroplasty	Shin,J.I.; Keswani,A.; Lovy,A.J.; Moucha,C.S.	2016	J.Arthroplasty	outcomes not specific to PJI
Do Pre-Operative Glycated Hemoglobin Levels Correlate with the Incidence of Revision in Diabetic Patients that Undergo Total Knee Arthroplasty?	Roche,M.; Law,T.Y.; Chughtai,M.; Elmallah,R.K.; Hubbard,Z.; Khlopas,A.; Mont,M.A.	2016	Surg.Technol.Int.	does not look at risk factors for revision due to infection
Total Knee Arthroplasty in the Younger Patient	Shah,S.H.; Schwartz,B.E.; Schwartz,A.R.; Goldberg,B.A.; Chmell,S.J.	2016	J.Knee Surg.	infection outcome not specific to pji
Complications Are Not Increased With Acetabular Revision of Metal-on-metal Total Hip Arthroplasty	Penrose,C.T.; Seyler,T.M.; Wellman,S.S.; Bolognesi,M.P.; Lachiewicz,P.F.	2016	Clin.Orthop.Relat.Res.	insufficient data to answer pico question. difference in infection rates between difference implant types are stratified by age, but the data is not sufficient to determine if age is a risk factor for PJI

Aspirin Can Be Used as Prophylaxis for Prevention of Venous Thromboembolism After Revision Hip and Knee Arthroplasty	Deirmengian,G.K.; Heller,S.; Smith,E.B.; Maltenfort,M.; Chen,A.F.; Parvizi,J.	2016	J.Arthroplasty	not relevant comparison since both groups get vte prophylaxis. also infection outcome not specific to pji
Does obesity affects early infection after total knee arthroplasty. A comparison of obese vs non obese patients	Ahmed,W.; Lakdawala,R.H.; Mohib,Y.; Qureshi,A.; Rashid,R.H.	2016	J.Pak.Med.Assoc.	infection outcome not specific to pji
Antibiotic-loaded bone cement reduces risk of infections in primary total knee arthroplasty? A systematic review	Schiavone,Panni A.; Corona,K.; Giulianelli,M.; Mazzitelli,G.; Del,Regno C.; Vasso,M.	2016	Knee Surg.Sports Traumatol.Arthrosc.	systematic review
Does pre-operative sampling predict intra-operative cultures and antibiotic sensitivities in knee replacements revised for infection?: a study using the NJR dataset	Holleyman,R.J.; Deehan,D.J.; Charlett,A.; Gould,K.; Baker,P.N.	2016	Knee Surg.Sports Traumatol.Arthrosc.	inadequate quality due to spectrum bias. samples were only available for 23% of patients, and culture negative specimins were not recorded in their databases.
Infection recurrence factors in one- and two-stage total knee prosthesis exchanges	Massin,P.; Delory,T.; Lhotellier,L.; Pasquier,G.; Roche,O.; Cazenave,A.; Estellat,C.; Jenny,J.Y.	2016	Knee Surg.Sports Traumatol.Arthrosc.	was a study of treatment, instead of prevention of pji
Predictors of hospital readmission following revision total knee arthroplasty	Belmont,P.J.,Jr.; Goodman,G.P.; Rodriguez,M.; Bader,J.O.; Waterman,B.R.; Schoenfeld,A.J.	2016	Knee Surg.Sports Traumatol.Arthrosc.	not relevant, since PJI is not the outcome, but is instead a predictor of hospital readmission
The results of two-stage revision TKA using Ceftazidime-Vancomycin-impregnated cement articulating spacers in Tsukayama Type II periprosthetic joint infections	Drexler,M.; Dwyer,T.; Kuzyk,P.R.; Kosashvilli,Y.; Abolghasemian,M.; Regev,G.J.; Kadar,A.; Rutenberg,T.F.; Backstein,D.	2016	Knee Surg.Sports Traumatol.Arthrosc.	not relevant. patients already had joint infection at start of the study
Approach to Decrease Infection Following Total Joint Arthroplasty	Hatz,D.; Anoushiravani,A.A.; Chambers,M.C.; El-Othmani,M.M.; Saleh,K.J.	2016	Orthop.Clin.North Am.	narrative review
Development and Validation of a Preoperative Surgical Site Infection Risk Score for Primary or Revision Knee and Hip Arthroplasty	Everhart,J.S.; Andridge,R.R.; Scharschmidt,T.J.; Mayerson,J.L.; Glassman,A.H.; Lemeshow,S.	2016	J.Bone Joint Surg.Am.	outcome not specific to pji
Infection and revision rates following primary total knee arthroplasty in patients with rheumatoid arthritis versus osteoarthritis: a meta-analysis	Lee,D.K.; Kim,H.J.; Cho,I.Y.; Lee,D.H.	2016	Knee Surg.Sports Traumatol.Arthrosc.	meta analysis

Does laminar flow ventilation reduce the rate of infection? an observational study of trauma in England	Pinder,E.M.; Bottle,A.; Aylin,P.; Loeffler,M.D.	2016	Bone Joint J.	Not relevant to criteria
Does bariatric surgery prior to total hip or knee arthroplasty reduce post-operative complications and improve clinical outcomes for obese patients? Systematic review and meta-analysis	Smith,T.O.; Aboelmagd,T.; Hing,C.B.; MacGregor,A.	2016	Bone Joint J.	systematic review
Eradication rates, risk factors, and implant selection in two-stage revision knee arthroplasty: a mid-term follow-up study	Hoell,S.; Sieweke,A.; Gosheger,G.; Hardes,J.; Dieckmann,R.; Ahrens,H.; Streitbuerger,A.	2016	J.Orthop.Surg.Res.	inadequate quality, due to sparse event rates, and ungeneralizable sample.
Moderating effects of immunosuppressive medications and risk factors for post-operative joint infection following total joint arthroplasty in patients with rheumatoid arthritis or osteoarthritis	Salt,E.; Wiggins,A.T.; Rayens,M.K.; Morris,B.J.; Mannino,D.; Hoellein,A.; Donegan,R.P.; Crofford,L.J.	2016	Semin.Arthritis Rheum.	not all patients had hip or knee arthroplasty
Intra-articular steroid injection for osteoarthritis of the hip prior to total hip arthroplasty : is it safe? a systematic review	Pereira,L.C.; Kerr,J.; Jolles,B.M.	2016	Bone Joint J.	systematic review
Complications of Primary Total Knee Arthroplasty Among Patients With Rheumatoid Arthritis, Psoriatic Arthritis, Ankylosing Spondylitis, and Osteoarthritis	Cancienne,J.M.; Werner,B.C.; Browne,J.A.	2016	J.Am.Acad.Orthop.Surg.	unclear if infection outcome is specific to PJI
Modifying Risk Factors for Total Joint Arthroplasty: Strategies That Work Nicotine	Springer,B.D.	2016	J.Arthroplasty	narrative review
Impact of adherence to local antibiotic prophylaxis guidelines on infection outcome after total hip or knee arthroplasty	Chandrananth,J.; Rabinovich,A.; Karahalios,A.; Guy,S.; Tran,P.	2016	J.Hosp.Infect.	infection outcome not specific to pji
Risk factors for periprosthetic joint infection following primary total hip or knee arthroplasty: a meta-analysis	Kong,L.; Cao,J.; Zhang,Y.; Ding,W.; Shen,Y.	2016	Int.Wound J.	meta analysis
Synovial Cytokines and the MSIS Criteria Are Not Useful for Determining Infection Resolution After Periprosthetic Joint	Frangiamore,S.J.; Siqueira,M.B.; Saleh,A.; Daly,T.; Higuera,C.A.;	2016	Clin.Orthop.Relat.Res.	Very low quality

Infection Explantation	Barsoum,W.K.			
Are Frozen Sections and MSIS Criteria Reliable at the Time of Reimplantation of Two-stage Revision Arthroplasty?	George,J.; Kwiecien,G.; Klika,A.K.; Ramanathan,D.; Bauer,T.W.; Barsoum,W.K.; Higuera,C.A.	2016	Clin.Orthop.Relat.Res.	evaluated a test in a cohort in which infected implant had already been removed
The effectiveness and safety of two prophylactic antibiotic regimes in hip-fracture surgery	Ahmed,I.; Khan,M.A.; Allgar,V.; Mohsen,A.	2016	Eur.J.Orthop.Surg.Traumatol.	not specific to hip and knee arthroplasty
A cost-effectiveness modelling study of strategies to reduce risk of infection following primary hip replacement based on a systematic review	Graves,N.; Wloch,C.; Wilson,J.; Barnett,A.; Sutton,A.; Cooper,N.; Merollini,K.; McCreanor,V.; Cheng,Q.; Burn,E.; Lamagni,T.; Charlett,A.	2016	Health Technol.Assess.	meta analysis
Risk factors and a prognostic model of hip periprosthetic infection recurrence after surgical treatment using articulating and non-articulating spacers	Tikhilov,R.; Bozhkova,S.; Denisov,A.; Labutin,D.; Shubnyakov,I.; Razorenov,V.; Artyukh,V.; Klitsenko,O.	2016	Int.Orthop.	not relevant, since patients were assesed for risk factors of treatment failure after the first stage of a two stage exchange. therefore patients evaluated before prosthesis was implanted.
Assessing In-Hospital Outcomes and Resource Utilization After Primary Total Joint Arthroplasty Among Underweight Patients	Anoushiravani,A.A.; Sayeed,Z.; Chambers,M.C.; Gilbert,T.J.; Scaife,S.L.; El-Othmani,M.M.; Saleh,K.J.	2016	J.Arthroplasty	infection outcome not specific to pji
Rivaroxaban Use for Thrombosis Prophylaxis Is Associated With Early Periprosthetic Joint Infection	Brimmo,O.; Glenn,M.; Klika,A.K.; Murray,T.G.; Molloy,R.M.; Higuera,C.A.	2016	J.Arthroplasty	not relevant to pico question, since all patients in the control group also recieved some form of chemical prophylaxis
Can Serum Albumin Level and Total Lymphocyte Count be Surrogates for Malnutrition to Predict Wound Complications After Total Knee Arthroplasty?	Morey,V.M.; Song,Y.D.; Whang,J.S.; Kang,Y.G.; Kim,T.K.	2016	J.Arthroplasty	insufficient data to separate the effects on PJI from the general "wound complications" outcome.
Does BMI influence clinical outcomes after total knee arthroplasty?	Daniilidis,K.; Yao,D.; Gosheger,G.; Berssen,C.; Budny,T.; Dieckmann,R.; Holl,S.	2016	Technol.Health Care	does not look at risk factors for PJI

Is Hypoalbuminemia Associated With Septic Failure and Acute Infection After Revision Total Joint Arthroplasty? A Study of 4517 Patients From the National Surgical Quality Improvement Program	Bohl,D.D.; Shen,M.R.; Kayupov,E.; Cvetanovich,G.L.; Della Valle,C.J.	2016	J.Arthroplasty	inadequate quality due to large amount of missing data on hypoalbuminemia, as well as high risk of misclassification bias by using hypoalbuminemia as a surrogate measure of malnutrition
Closed-Incision Negative-Pressure Therapy Versus Antimicrobial Dressings After Revision Hip and Knee Surgery: A Comparative Study	Cooper,H.J.; Bas,M.A.	2016	J.Arthroplasty	Not relevant to criteria
Two-stage revision arthroplasty for periprosthetic joint infections: What is the value of cultures and white cell count in synovial fluid and CRP in serum before second stage reimplantation?	Hoell,S.; Moeller,A.; Gosheger,G.; Hardes,J.; Dieckmann,R.; Schulz,D.	2016	Arch.Orthop.Trauma Surg.	evaluated the diagnostic test in patients who already had infected prosthesis removed
Meta-analysis shows that obesity may be a significant risk factor for prosthetic joint infections	Ma,Z.; Guo,F.; Qi,J.; Xiang,W.; Zhang,J.	2016	Int.Orthop.	meta-analysis
The Timing of Total Hip Arthroplasty After Intraarticular Hip Injection Affects Postoperative Infection Risk	Werner,B.C.; Cancienne,J.M.; Browne,J.A.	2016	J.Arthroplasty	outcome not specific to pji
Body Mass Index More Than 45 kg/m(2) as a Cutoff Point Is Associated With Dramatically Increased Postoperative Complications in Total Knee Arthroplasty and Total Hip Arthroplasty	Adhikary,S.D.; Liu,W.M.; Memtsoudis,S.G.; Davis,C.M.,III; Liu,J.	2016	J.Arthroplasty	infection outcome not specific to pji
Multiplex Antibody Detection for Noninvasive Genus-Level Diagnosis of Prosthetic Joint Infection	Marmor,S.; Bauer,T.; Desplaces,N.; Heym,B.; Roux,A.L.; Sol,O.; Roge,J.; Mahe,F.; Desire,L.; Aegerter,P.; Ghout,I.; Ropers,J.; Gaillard,J.L.; Rottman,M.	2016	J.Clin.Microbiol.	patient spectrum not representative of population defined in pico question
Can the presence of an infection be predicted before a revision total hip arthroplasty? Preliminary study to establish an infection score	Jenny,J.Y.; Adamczewski,B.; De,Thomasson E.; Godet,J.; Bonfait,H.; Delaunay,C.	2016	Orthop.Traumatol.Surg.Res.	not relevant to pico question. the intent of the article is to develop a prediction score distinguishing between septic and aseptic revision patients, and not to determine risk of septic revision among al THA patients.

Rivaroxaban for thromboprophylaxis after total hip or knee arthroplasty: a meta-analysis with trial sequential analysis of randomized controlled trials	Ning,G.Z.; Kan,S.L.; Chen,L.X.; Shangguan,L.; Feng,S.Q.; Zhou,Y.	2016	Sci.Rep.	systematic review
Patient-Related Risk Factors for Periprosthetic Joint Infection after Total Joint Arthroplasty: A Systematic Review and Meta-Analysis	Kunutsor,S.K.; Whitehouse,M.R.; Blom,A.W.; Beswick,A.D.	2016	PLoS One	systematic review
Outcome Predictors in Prosthetic Joint Infections--Validation of a risk stratification score for Prosthetic Joint Infections in 120 cases	Wimmer,M.D.; Randau,T.M.; Friedrich,M.J.; Ploeger,M.M.; Schmolder,J.; Strauss,A.C.; Pennekamp,P.H.; Vavken,P.; Gravius,S.	2016	Acta Orthop.Belg.	not relevant to pico question since outcome is treatment and elimation of infection instead of prevention of infection
Clostridium difficile-associated diarrhoea in primary joint arthroplasty in Aneurin Bevan University Health Board South	Blocker,O.; Abdulkadir,U.; Roberts,P.	2016	Ann.R Coll.Surg.Engl.	not all patients got TJA
Debridement, antibiotics and implant retention in early periprosthetic joint infection	Bergkvist,M.; Mukka,S.S.; Johansson,L.; Ahl,T.E.; Sayed-Noor,A.S.; Skoldenberg,O.G.; Eisler,T.	2016	Hip Int.	not relevant. study of debridement and retention treatment for infection
Total Hip Arthroplasty in Patient with Aplastic Anemia	Lim,Y.W.; Kim,S.C.; Kwon,S.Y.; Park,do J.; Kim,Y.S.	2016	Hip Pelvis.	retrospective case series
The use of calcium carbonate beads containing gentamicin in the second stage septic revision of total knee arthroplasty reduces reinfection rate	Marczak,D.; Synder,M.; Sibinski,M.; Okon,T.; Kowalczewski,J.	2016	Knee	not relevant to prevention. studies treatment for pji
Updated Outcomes of Prophylactic Femoral Fixation	Kreul,S.M.; Sorger,J.I.; Rajamanickam,V.P.; Heiner,J.P.	2016	Orthopedics	infection outcome not specific to pji
Effect of oral factor Xa inhibitor and low-molecular-weight heparin on surgical complications following total hip arthroplasty	Kim,S.M.; Moon,Y.W.; Lim,S.J.; Kim,D.W.; Park,Y.S.	2016	Thromb.Haemost.	not relvant to pico question, since anticoagulation drugs given post operatively
In-hospital mortality analysis in patients with proximal femoral fracture operatively treated by hip arthroplasty procedure	Starcevic,S.; Suljagic,V.; Stamenkovic,D.; Bokonjic,D.; Munitlak,S.	2016	Vojnosanit.Pregl.	not relevant to pico question. evaluates infection as a risk factor for mortality

The impact of including corticosteroid in a periarticular injection for pain control after total knee arthroplasty: a double-blind randomised controlled trial	Tsukada,S.; Wakui,M.; Hoshino,A.	2016	Bone Joint J.	corticosteroids given intraoperatively instead of preopoeratively
Prevalence of asymptomatic bacteriuria in knee arthroplasty patients and subsequent risk of prosthesis infection	Martinez-Velez,D.; Gonzalez-Fernandez,E.; Esteban,J.; Cordero-Ampuero,J.	2016	Eur.J.Orthop.Surg.Traumatol.	less than 25 patients had asymptomatic bacteriuria
alpha-Defensin Accuracy to Diagnose Periprosthetic Joint Infection-Best Available Test?	Frangiamore,S.J.; Gajewski,N.D.; Saleh,A.; Farias-Kovac,M.; Barsoum,W.K.; Higuera,C.A.	2016	J.Arthroplasty	inadequate quality due to spectrum bias. tests were performed on some patients who were indicated for aseptic revision
Characteristics, interactions and coating adherence of heterogeneous polymer/drug coatings for biomedical devices	McManamon,C.; de Silva,J.P.; Delaney,P.; Morris,M.A.; Cross,G.L.	2016	Mater.Sci.Eng.C.Mater.Biol.Appl.	Not relevant to criteria
Predictors of failure for prosthetic joint infections treated with debridement	Letouvet,B.; Arvieux,C.; Leroy,H.; Polard,J.L.; Chapplain,J.M.; Common,H.; Ecoffey,C.; Huten,D.; Jolivet-Gougeon,A.; Tattevin,P.	2016	Med.Mal.Infect.	Not relevant to criteria
Burden of Surgical Site Infections Associated with Arthroplasty and the Contribution of Staphylococcus aureus	Patel,H.; Khoury,H.; Girgenti,D.; Welner,S.; Yu,H.	2016	Surg.Infect.(Larchmt.)	systematic review
Effectiveness of closed suction drainage tip culture in hip arthroplasty	Park,J.H.; Shon,H.C.; Kim,J.W.; Park,S.J.; Ko,T.S.; Park,J.H.	2016	Acta Orthop.Traumatol.Turc.	Not relevant to criteria
Intraoperative Corticosteroid Injection at the Time of Knee Arthroscopy Is Associated With Increased Postoperative Infection Rates in a Large Medicare Population	Cancienne,J.M.; Gwathmey,F.W.; Werner,B.C.	2016	Arthroscopy	was arthroscopy study, not arthroplasty.
The epidemiology of failure in total knee arthroplasty: avoiding your next revision	Khan,M.; Osman,K.; Green,G.; Haddad,F.S.	2016	Bone Joint J.	literature review
Treatment of Periprosthetic Knee Infection With a Two-stage Protocol Using Static Spacers	Lichstein,P.; Su,S.; Hedlund,H.; Suh,G.; Maloney,W.J.; Goodman,S.B.; Huddleston,J.I.,III	2016	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study

Does Preoperative Antimicrobial Prophylaxis Influence the Diagnostic Potential of Periprosthetic Tissues in Hip or Knee Infections?	Bedencic,K.; Kavcic,M.; Faganeli,N.; Mihalic,R.; Mavcic,B.; Dolenc,J.; Bajc,Z.; Trebse,R.	2016	Clin.Orthop.Relat.Res.	not relevant to prevention pico questions
The Chitranjan Ranawat Award: Running Subcuticular Closure Enables the Most Robust Perfusion After TKA: A Randomized Clinical Trial	Wyles,C.C.; Jacobson,S.R.; Houdek,M.T.; Larson,D.R.; Taunton,M.J.; Sim,F.H.; Sierra,R.J.; Trousdale,R.T.	2016	Clin.Orthop.Relat.Res.	Population size is less than 25 in each group
Mid term results of total hip arthroplasty using polyethylene-ceramic composite (Sandwich) liner	Wang,T.; Sun,J.Y.; Zha,G.C.; Dong,S.J.; Zhao,X.J.	2016	Indian J.Orthop.	infection outcome not specific to pji
Incidence And Risk Factors For 30-Day Readmissions After Hip Fracture Surgery	Martin,C.T.; Gao,Y.; Pugely,A.J.	2016	Iowa Orthop.J.	not specific to hip and knee replacement patients
Is Preoperative Nasal Povidone-Iodine as Efficient and Cost-Effective as Standard Methicillin-Resistant Staphylococcus aureus Screening Protocol in Total Joint Arthroplasty?	Torres,E.G.; Lindmair-Snell,J.M.; Langan,J.W.; Burnikel,B.G.	2016	J.Arthroplasty	infection outcome not specific to pji
Do 'Surgical Helmet Systems' or 'Body Exhaust Suits' Affect Contamination and Deep Infection Rates in Arthroplasty? A Systematic Review	Young,S.W.; Zhu,M.; Shirley,O.C.; Wu,Q.; Spangehl,M.J.	2016	J.Arthroplasty	Systematic review
The Effect of Subluxation of Articulating Antibiotic Spacers on Bone Defects and Degree of Constraint in Revision Knee Arthroplasty	Lau,A.C.; Howard,J.L.; MacDonald,S.J.; Teeter,M.G.; Lanting,B.A.	2016	J.Arthroplasty	not relevant. patients already had joint infection at start of the study
Preoperative Acute Inflammatory Markers as Predictors for Postoperative Complications in Primary Total Knee Arthroplasty	Godoy,G.; Sumarriva,G.; Ochsner,J.L.,Jr.; Chimento,G.; Schmucker,D.; Dasa,V.; Meyer,M.	2016	Ochsner J.	not relevant. risk factors for PJI not studied
Intra-articular treatment of knee osteoarthritis: from anti-inflammatories to products of regenerative medicine	Richards,M.M.; Maxwell,J.S.; Weng,L.; Angelos,M.G.; Golzarian,J.	2016	Phys.Sportsmed.	systematic review
Use of antibiotic-loaded cement in total knee arthroplasty	Hinarejos,P.; Guirro,P.; Puig-Verdie,L.; Torres-Claramunt,R.; Leal-Blanquet,J.; Sanchez-Soler,J.; Monllau,J.C.	2015	World J.Orthop.	Narrative review

The Impact of Hepatitis C on Short-Term Outcomes of Total Joint Arthroplasty	Issa,K.; Boylan,M.R.; Naziri,Q.; Perfetti,D.C.; Maheshwari,A.V.; Mont,M.A.	2015	J.Bone Joint Surg.Am.	does not look at risk factors for pji
Management of Modifiable Risk Factors Prior to Primary Hip and Knee Arthroplasty: A Readmission Risk Assessment Tool	Boraiah,S.; Joo,L.; Inneh,I.A.; Rathod,P.; Meftah,M.; Band,P.; Bosco,J.A.; Iorio,R.	2015	J.Bone Joint Surg.Am.	outcomes not specific to PJI
Selective Methicillin-Resistant Staphylococcus Aureus (MRSA) screening of a high risk population does not adequately detect MRSA carriers within a country with low MRSA prevalence	de,Wouters S.; Daxhelet,J.; Kaminski,L.; Thienpont,E.; Cornu,O.; Yombi,J.C.	2015	Acta Orthop.Belg.	not relvant. outcome is being a mrsa carrier, not post op PJI
Unicompartmental knee replacement in the elderly: a systematic review	Howieson,A.; Farrington,W.	2015	Acta Orthop.Belg.	systematic review
Hypoalbuminemia More Than Morbid Obesity is an Independent Predictor of Complications After Total Hip Arthroplasty	Walls,J.D.; Abraham,D.; Nelson,C.L.; Kamath,A.F.; Elkassabany,N.M.; Liu,J.	2015	J.Arthroplasty	very low quality due to missing data and ungeneralizable patient sample
Systematic review and meta-analysis of randomized controlled trials of antibiotics and antiseptics for preventing infection in people receiving primary total hip and knee prostheses	Voigt,J.; Mosier,M.; Darouiche,R.	2015	Antimicrob.Agents Chemother.	Systematic review
Association between dementia and postoperative complications after hip fracture surgery in the elderly: analysis of 87,654 patients using a national administrative database	Tsuda,Y.; Yasunaga,H.; Horiguchi,H.; Ogawa,S.; Kawano,H.; Tanaka,S.	2015	Arch.Orthop.Trauma Surg.	not specific to arthoplasty patients
Impact of obesity on the risk of wound infection following surgery: results from a nationwide prospective multicentre cohort study in England	Thelwall,S.; Harrington,P.; Sheridan,E.; Lamagni,T.	2015	Clin.Microbiol.Infect.	outcomes not specific to PJI
Are There Modifiable Risk Factors for Hospital Readmission After Total Hip Arthroplasty in a US Healthcare System?	Paxton,E.W.; Inacio,M.C.; Singh,J.A.; Love,R.; Bini,S.A.; Namba,R.S.	2015	Clin.Orthop.Relat.Res.	doesn't answer pico. risk factors for pji not evaluated.
Clinical value of SPECT/CT in the painful total knee arthroplasty (TKA): a prospective study in a consecutive series of 100 TKA	Hirschmann,M.T.; Amsler,F.; Rasch,H.	2015	Eur.J.Nucl.Med.Mol.Imaging	Not relevant to criteria

Skin staples versus intradermal wound closure following primary hip arthroplasty: a prospective, randomised trial including 231 cases	Buttaro,M.A.; Quinteros,M.; Martorell,G.; Zanotti,G.; Comba,F.; Piccaluga,F.	2015	Hip Int.	Not relevant to criteria
Prosthetic joint infection following hip fracture and degenerative hip disorder: a cohort study of three thousand, eight hundred and seven consecutive hip arthroplasties with a minimum follow-up of five years	Blomfeldt,R.; Kasina,P.; Ottosson,C.; Enocson,A.; Lapidus,L.J.	2015	Int.Orthop.	Not relevant to criteria
Does Timing of Previous Intra-Articular Steroid Injection Affect the Post-Operative Rate of Infection in Total Knee Arthroplasty?	Cancienne,J.M.; Werner,B.C.; Luetkemeyer,L.M.; Browne,J.A.	2015	J.Arthroplasty	outcome not specific to pji
Short term evaluation of total hip arthroplasty; our experience at tertiary care center	Saeed,U.B.; Ahmad Khan,R.D.; Zain-Ur-Rehman,M.; Yasin,A.	2015	J.Pak.Med.Assoc.	does not look at risk factors for infection
Antibiotic prophylaxis in hip surgery: A comparision of two vs. three doses of cefuroxime	Nadeem,R.D.; Akhtar,M.; Cheema,O.I.; Hashmi,A.R.; Nadeem,M.J.; Nadeem,A.	2015	J.Pak.Med.Assoc.	not relevant to pico question. compares doses of same antibiotic at anesthesia and at end of procedure vs dose at anestehesia and at post op hours 8 and 16 of the same drug
Low Albumin Levels, More Than Morbid Obesity, Are Associated With Complications After TKA	Nelson,C.L.; Elkassabany,N.M.; Kamath,A.F.; Liu,J.	2015	Clin.Orthop.Relat.Res.	very low quality due to missing data and high risk of misclassification of malnutrition status
Modified Protocol Decreases Surgical Site Infections after Total Knee Arthroplasty	Lamplot,J.D.; Luther,G.; Mawdsley,E.L.; Luu,H.H.; Manning,D.	2015	J.Knee Surg.	does not answer pico questions. unable to separate the independent effects of each infection control protocol in post intervention period
Use of Negative-Pressure Wound Dressings to Prevent Surgical Site Complications After Primary Hip Arthroplasty: A Pilot RCT	Gillespie,B.M.; Rickard,C.M.; Thalib,L.; Kang,E.; Finigan,T.; Homer,A.; Lonie,G.; Pitchford,D.; Chaboyer,W.	2015	Surg.Innov.	Not relevant to criteria
Patient-related medical risk factors for periprosthetic joint infection of the hip and knee	Eka,A.; Chen,A.F.	2015	Ann.Transl.Med.	narrative review
Two-stage revision of prosthetic hip joint infections using antibiotic-loaded cement spacers: When is the best time to perform	Vielgut,I.; Sadoghi,P.; Wolf,M.; Holzer,L.; Leithner,A.; Schwantzer,G.;	2015	Int.Orthop.	not relevant. included patients who already had prosthesis or native joint infection

the second stage?	Poolman,R.; Frankl,B.; Glehr,M.			
Bariatric Surgery Prior to Total Knee Arthroplasty is Associated With Fewer Postoperative Complications	Werner,B.C.; Kurkis,G.M.; Gwathmey,F.W.; Browne,J.A.	2015	J.Arthroplasty	infection outcome not specific to pji
The Incidence of and Risk Factors for 30-Day Surgical Site Infections Following Primary and Revision Total Joint Arthroplasty	Pugely,A.J.; Martin,C.T.; Gao,Y.; Schweizer,M.L.; Callaghan,J.J.	2015	J.Arthroplasty	infection outcome not specific to pji
Risk Factors for Recurrence of Periprosthetic Knee Infection	Sakellariou,V.I.; Poultsides,L.A.; Vasilakakos,T.; Sculco,P.; Ma,Y.; Sculco,T.P.	2015	J.Arthroplasty	not relevant to prevention. studies risk factors for pji treatment failure.
Does HIV Infection Increase the Risk of Short-Term Adverse Outcomes Following Total Knee Arthroplasty?	Boylan,M.R.; Basu,N.; Naziri,Q.; Issa,K.; Maheshwari,A.V.; Mont,M.A.	2015	J.Arthroplasty	infection outcome not specific to pji
Can tranexamic acid change preoperative anemia management during total joint arthroplasty?	Phan,D.L.; Rinehart,J.B.; Schwarzkopf,R.	2015	World J.Orthop.	unclear if acute infection is specific to pji
Early Outcomes of Primary Total Hip Arthroplasty for Osteonecrosis of the Femoral Head in Patients with Human Immunodeficiency Virus in China	Zhao,C.S.; Li,X.; Zhang,Q.; Sun,S.; Zhao,R.G.; Cai,J.	2015	Chin.Med.J.(Engl.)	inadequate quality due to lack of confounding (probably because of small sample size) adjustment, unclear definition of wound healing, and low statistical power due to zero event rate
Chronic Suppression of Periprosthetic Joint Infections with Oral Antibiotics Increases Infection-Free Survivorship	Siqueira,M.B.; Saleh,A.; Klika,A.K.; O'Rourke,C.; Schmitt,S.; Higuera,C.A.; Barsoum,W.K.	2015	J.Bone Joint Surg.Am.	was a study of treatment of PJI's, instead of PJI prevention
KLIC-score for predicting early failure in prosthetic joint infections treated with debridement, implant retention and antibiotics	Tornero,E.; Morata,L.; Martinez-Pastor,J.C.; Bori,G.; Climent,C.; Garcia-Velez,D.M.; Garcia-Ramiro,S.; Bosch,J.; Mensa,J.; Soriano,A.	2015	Clin.Microbiol.Infect.	not relevant. non-arthroplasty patients studies.
Barbed versus standard sutures in total knee arthroplasty: a meta-analysis	Meena,S.; Gangary,S.; Sharma,P.; Chowdhury,B.	2015	Eur.J.Orthop.Surg.Traumatol.	Meta analysis
Is Drain Tip Culture Prognostic of Surgical Site Infection? Results of 1380 Drain Tip	Takada,R.; Jinno,T.; Koga,D.; Hirao,M.; Muneta,T.;	2015	J.Arthroplasty	test not relevant to pico question

Cultures in Total Hip Arthroplasty	Okawa,A.			
Premature Therapeutic Antimicrobial Treatments Can Compromise the Diagnosis of Late Periprosthetic Joint Infection	Shahi,A.; Deirmengian,C.; Higuera,C.; Chen,A.; Restrepo,C.; Zmistowski,B.; Parvizi,J.	2015	Clin.Orthop.Relat.Res.	inadequate quality due to spectum bias. excluded patients with inflamatory disease, immunospuppressive therapy and patients with early pji
Implementing Evidence-Based Practice to Reduce Infections Following Arthroplasty	Mori,C.	2015	Orthop.Nurs.	ssi outcome
26Postoperative diagnosis and outcome in patients with revision arthroplasty for aseptic loosening	Fernandez-Sampedro,M.; Salas-Venero,C.; Farinas-Alvarez,C.; Sumillera,M.; Perez-Carro,L.; Fakkas-Fernandez,M.; Gomez-Roman,J.; Martinez-Martinez,L.; Farinas,M.C.	2015	BMC Infect.Dis.	patient population not relevant to pico question. only includes patients with presumed aseptic loosening.
Effectiveness of gentamicin-containing collagen sponges for prevention of surgical site infection after hip arthroplasty: a multicenter randomized trial	Westberg,M.; Frihagen,F.; Brun,O.C.; Figved,W.; Grogaard,B.; Valland,H.; Wangen,H.; Snorrason,F.	2015	Clin.Infect.Dis.	patients did not get total joint replacement
The Effect of an Interdisciplinary QI Project to Reduce OR Foot Traffic	Rovaldi,C.J.; King,P.J.	2015	AORN J.	Not relevant to criteria
The influence of body mass index on the outcomes of primary total knee arthroplasty	Si,H.B.; Zeng,Y.; Shen,B.; Yang,J.; Zhou,Z.K.; Kang,P.D.; Pei,F.X.	2015	Knee Surg.Sports Traumatol.Arthrosc.	
Deep Infections after Endoprosthetic Replacement Operations in Orthopedic Oncology Patients	Dhanoa,A.; Ajit,Singh,V; Elbahri,H.	2015	Surg.Infect.(Larchmt.)	not specific to hip and knee replacement
Perioperative Skin Preparation and Draping in Modern Total Joint Arthroplasty: Current Evidence	Markatos,K.; Kaseta,M.; Nikolaou,V.S.	2015	Surg.Infect.(Larchmt.)	systematic reivew
Efficacy of steroid addition to multimodal cocktail periarticular injection in total knee arthroplasty: a meta-analysis	Zhao,X.; Qin,J.; Tan,Y.; Mohanan,R.; Hu,D.; Chen,L.	2015	J.Orthop.Surg.Res.	meta-analysis
Complications Encountered with Total Hip Arthroplasty in Rheumatoid Patients	Aresti,N.A.; Khan,W.S.; Malik,A.	2015	Curr Rheumatol.Rev.	narrative review

Rheumatoid arthritis is associated with higher ninety-day hospital readmission rates compared to osteoarthritis after hip or knee arthroplasty: a cohort study	Singh,J.A.; Inacio,M.C.; Namba,R.S.; Paxton,E.W.	2015	Arthritis Care Res.(Hoboken.)	insufficient data for the readmission for PJI outcome, although the study is well designed to look at risk factors for overall readmission.
Do glycemic markers predict occurrence of complications after total knee arthroplasty in patients with diabetes?	Hwang,J.S.; Kim,S.J.; Bamne,A.B.; Na,Y.G.; Kim,T.K.	2015	Clin.Orthop.Relat.Res.	insufficient data for analysis. no statistical analysis was done for PJI, since there was zero events due to small sample size. the number patients in each patient group was unclear, so we could not do any analysis
Prospective study on antimicrobial prophylaxis in total hip arthroplasty	Yuasa,T.; Yamakawa,J.; Maezawa,K.; Kaneko,K.	2015	Eur.J.Orthop.Surg.Traumatol.	not relevant comparison. compares different doses of the same drug
Long-term survival of a semi-constrained implant following revision for infection	Wilke,B.; Wagner,E.; Trousdale,R.	2015	J.Arthroplasty	was a study of treatment of PJI's, instead of PJI prevention
Primary Total Knee Arthroplasty in Super-obese Patients: Dramatically Higher Postoperative Complication Rates Even Compared to Revision Surgery	Werner,B.C.; Evans,C.L.; Carothers,J.T.; Browne,J.A.	2015	J.Arthroplasty	infection outcome not specific to pji
Lifting incise drapes off the skin during wound closure can cause contamination	Makki,D.; Probert,N.; Gedela,V.; Kustos,I.; Thonse,R.; Banim,R.	2015	J.Perioper.Pract.	Not relevant to criteria
The influence of obesity on primary total hip arthroplasty outcomes: A meta-analysis of prospective cohort studies	Liu,W.; Wahafu,T.; Cheng,M.; Cheng,T.; Zhang,Y.; Zhang,X.	2015	Orthop.Traumatol.Surg.Res.	systematic review
Analysis of Risk Factors for Periprosthetic Joint Infection in Clinical Data	Walczak,P.; Rak,S.; Bialecki,J.; Marczynski,W.	2015	Ortop.Traumatol.Rehabil.	does not evaluate risk factors for PJI, but rather is a descriptive study of the prevalence of risk factors only in patients who have PJI
Smoking and risk of prosthesis-related complications after total hip arthroplasty: a meta-analysis of cohort studies	Teng,S.; Yi,C.; Krettek,C.; Jagodzinski,M.	2015	PLoS One	meta-analysis
Preoperative skin antiseptics for preventing surgical wound infections after clean surgery	Dumville,J.C.; McFarlane,E.; Edwards,P.; Lipp,A.; Holmes,A.; Liu,Z.	2015	Cochrane Database Syst.Rev.	Systematic review
Clinical characteristics, microbiology, and outcomes of prosthetic joint infection in Taiwan	Tsai,J.C.; Sheng,W.H.; Lo,W.Y.; Jiang,C.C.; Chang,S.C.	2015	J.Microbiol.Immunol.Infect.	not relevant to pico question. studies outcomes after treatment for infection, rather than prevention of infection
Preoperative screening for MRSA/MSSA	Clifford,T.	2015	J.Perianesth.Nurs.	review

Lack of efficacy of prophylactic application of antibiotic-loaded bone cement for prevention of infection in primary total knee arthroplasty: results of a meta-analysis	Zhou,Y.; Li,L.; Zhou,Q.; Yuan,S.; Wu,Y.; Zhao,H.; Wu,H.	2015	Surg.Infect.(Larchmt.)	meta-analysis
The effect of 2 adhesive products on skin integrity used for fixation of hip and knee surgical dressings: a randomized controlled trial	Ter,N.; Yavuz,M.; Aydogdu,S.; Kaya,Bicer E.	2015	J.Wound Ostomy.Continence.Nurs.	Not relevant to criteria
Morbid obesity: a significant risk factor for failure of two-stage revision total hip arthroplasty for infection	Houdek,M.T.; Wagner,E.R.; Watts,C.D.; Osmon,D.R.; Hanssen,A.D.; Lewallen,D.G.; Mabry,T.M.	2015	J.Bone Joint Surg.Am.	inadequate quality, from due to low event rates, lack of adjustment for comorbidites due to low statistical power and unclear description how how obesity data was collected
Decreasing prosthetic joint surgical site infections: an interdisciplinary approach	Mejia,E.; Williams,A.; Long,M.	2015	AORN J.	Not relevant to criteria
Can intra-articular therapies prior to total knee arthroplasty increase the risk of periprosthetic infection?	Yeo,Q.Y.; Lye,D.C.; Sathappan Ss,S.S.	2015	Med.J.Malaysia	case report
Intraarticular hip injection and early revision surgery following total hip arthroplasty: a retrospective cohort study	Ravi,B.; Escott,B.G.; Wasserstein,D.; Croxford,R.; Hollands,S.; Paterson,J.M.; Kreder,H.J.; Hawker,G.A.	2015	Arthritis Rheumatol.	unclear if all patients had injections of hyaluronic acid and/or corticosteroids.
Interleukin-6 in two-stage revision arthroplasty: what is the threshold value to exclude persistent infection before re-implanatation?	Hoell,S.; Borgers,L.; Gosheger,G.; Dieckmann,R.; Schulz,D.; Gerss,J.; Hardes,J.	2015	Bone Joint J.	evaluates test in patients in which infected implant had already been removed
The John Insall Award: Morbid obesity independently impacts complications, mortality, and resource use after TKA	D'Apuzzo,M.R.; Novicoff,W.M.; Browne,J.A.	2015	Clin.Orthop.Relat.Res.	infection outcome not specific to pji
Drain tip cultures do not predict infections in primary total knee arthroplasty	Lazureanu,V.; Radu,D.; Vermesan,D.; Prejbeanu,R.; Florescu,S.; Trocan,I.; Damian,S.; Inchingolo,F.; Abbinante,A.; Dipalma,G.; Caprio,M.; Cagiano,R.; Potenza,M.A.; Haragus,H.	2015	Clin.Ter.	Not relevant to criteria
An Insight into Methods and Practices in Hip Arthroplasty in Patients with	Mosleh-Shirazi,M.S.; Ibrahim,M.; Pastides,P.;	2015	Int.J.Rheumatol.	narrative review

Rheumatoid Arthritis	Khan,W.; Rahman,H.			
Long term follow-up of successfully treated superficial wound infections following TKA	Guirro,P.; Hinarejos,P.; Pelfort,X.; Leal-Blanquet,J.; Torres-Claramunt,R.; Puig-Verdie,L.	2015	J.Arthroplasty	not relevant. does not evaluate risk factors for pji
Blood transfusion in primary total hip and knee arthroplasty. Incidence, risk factors, and thirty-day complication rates	Hart,A.; Khalil,J.A.; Carli,A.; Huk,O.; Zukor,D.; Antoniou,J.	2014	J.Bone Joint Surg.Am.	for most risk factors relevant to pico question, infection outcome wasn't specific to pji. for transfusion as a surrogate risk factor of anemia, PJI was looked at, but the authors note they included transfusions for any indication, which is not specific to anemia
Traditions and myths in hip and knee arthroplasty	Husted,H.; Gromov,K.; Malchau,H.; Freiberg,A.; Gebuhr,P.; Troelsen,A.	2014	Acta Orthop.	Narrative review
Efficacy of skin preparation in eradicating organisms before total knee arthroplasty	Boe,E.; Sanchez,H.B.; Kazenske,F.M.; Wagner,R.A.	2014	Am.J.Orthop.(Belle.Mead.NJ.)	no relevant outcomes to pico question. also, no results were reported.
Outcome of patients over 80 years of age on prolonged suppressive antibiotic therapy for at least 6 months for prosthetic joint infection	Prendki,V.; Zeller,V.; Passeron,D.; Desplaces,N.; Mamoudy,P.; Stirnemann,J.; Marmor,S.; Ziza,J.M.	2014	Int.J.Infect.Dis.	not relevant. patients were treated without operation
Review article: Total hip replacement in haemodialysis or renal transplant patients	Lieu,D.; Harris,I.A.; Naylor,J.M.; Mittal,R.	2014	J.Orthop.Surg.(Hong Kong)	narrative review
Mid-term results of metal-on-metal hip resurfacing for treatment of osteoarthritis secondary to developmental dysplasia of the hip: a minimum of 8-years of follow-up	Qu,Y.; Jiang,T.; Zhao,H.; Gao,Y.; Zheng,C.; Xu,J.	2014	Med.Sci.Monit.	does not evaluate risk factors for infection
Dose intraarticular steroid injection increase the rate of infection in subsequent arthroplasty: grading the evidence through a meta-analysis	Xing,D.; Yang,Y.; Ma,X.; Ma,J.; Ma,B.; Chen,Y.	2014	J.Orthop.Surg.Res.	systematic review
Safety of desirudin in thrombosis prevention after total knee arthroplasty: the DESIR-ABLE study	Jove,M.; Maslanka,M.; Minkowitz,H.S.; Jaffer,A.K.	2014	Am.J.Ther	not relevant. patients giving anticoag. drugs postoperatively
Effect of postoperative use of nasal oxygen catheter supplementation in wound healing following total knee	Helito,C.P.; Junqueira,J.J.; Gobbi,R.G.; Angelini,F.J.; Rezende,M.U.; Tirico,L.E.;	2014	Clinics (Sao Paulo)	Not relevant to criteria

arthroplasty	Demange,M.K.; Mota e Albuquerque RF; Pecora,J.R.; Camanho,G.L.			
Do intra-articular steroid injections increase infection rates in subsequent arthroplasty? A systematic review and meta-analysis of comparative studies	Charalambous,C.P.; Prodromidis,A.D.; Kwaees,T.A.	2014	J.Arthroplasty	meta analysis
Unexpected positive intraoperative cultures in aseptic revision arthroplasty	Saleh,A.; Guirguis,A.; Klika,A.K.; Johnson,L.; Higuera,C.A.; Barsoum,W.K.	2014	J.Arthroplasty	patient spectum specific to presumed aseptic revision patients, and is not representative of patient population of PICO question, making article inadequate quality to answer question
Are there identifiable risk factors and causes associated with unplanned readmissions following total knee arthroplasty?	Kheir,M.M.; Clement,R.C.; Derman,P.B.; Flynn,D.N.; Speck,R.M.; Levin,L.S.; Fleisher,L.A.	2014	J.Arthroplasty	not relevant. does not evaluate risk factors for pji
The host response: Toll-like receptor expression in periprosthetic tissues as a biomarker for deep joint infection	Cipriano,C.; Maiti,A.; Hale,G.; Jiranek,W.	2014	J.Bone Joint Surg.Am.	greater than 10 percent had tests evaluated in patients who had already had infected implant removed.
Does previous intra-articular steroid injection increase the risk of joint infection following total hip arthroplasty or total knee arthroplasty? A meta-analysis	Wang,Q.; Jiang,X.; Tian,W.	2014	Med.Sci.Monit.	meta analysis
Surgical Site Infection In Orthopaedic Surgery: Correlation Between Age, Diabetes, Smoke And Surgical Risk	Fisichella,L.; Fenga,D.; Rosa,M.A.	2014	Folia Med.(Plovdiv.)	infection outcome not specific to pji
Serum inflammatory markers for periprosthetic knee infection in obese versus non-obese patients	Liu,J.Z.; Saleh,A.; Klika,A.K.; Barsoum,W.K.; Higuera,C.A.	2014	J.Arthroplasty	inadequate quality due to spectrum bias. excluded patients without aspiration taken within 40 days of revision, and patients without complete BMI data
Length of storage of transfused red blood cells and risk of prosthetic joint infection after primary knee arthroplasty	Gomez-Lesmes,S.P.; Tornero,E.; Martinez-Pastor,J.C.; Pereira,A.; Marcos,M.; Soriano,A.	2014	J.Arthroplasty	insufficient reporting of risk factors relevant to pico question
Potential changes to French recommendations about peri-prosthetic infections based on the international consensus meeting (ICMPJI)	Ollivier,M.; Senneville,E.; Drancourt,M.; Argenson,J.N.; Migaud,H.	2014	Orthop.Traumatol.Surg.Res.	review

Risk factors of surgical site infections in hip hemiarthroplasty: a single-institution experience over nine years	Lau,A.C.; Neo,G.H.; Lee,H.C.	2014	Singapore Med.J.	infection outcome not specific to pji
Risk factors for surgical site infection following total joint arthroplasty	Rasouli,M.R.; Restrepo,C.; Maltenfort,M.G.; Purtill,J.J.; Parvizi,J.	2014	J.Bone Joint Surg.Am.	SSI outcome not specific to pji
Morbid obesity: a significant risk factor for failure of two-stage revision total knee arthroplasty for infection	Watts,C.D.; Wagner,E.R.; Houdek,M.T.; Osmon,D.R.; Hanssen,A.D.; Lewallen,D.G.; Mabry,T.M.	2014	J.Bone Joint Surg.Am.	inadequate quality. small sample size and low event rate made it impossible to control for many important confounders
Efficacy and Cost-Benefit Analysis of a Global Environmental Cleaning Algorithm on Hospital-Acquired Infection Rates	Everett,B.R.; Sitton,J.T.; Wilson,M.	2014	J.Patient Saf.	Cost effectiveness analysis
The incidence of postoperative urinary retention in patients undergoing elective hip and knee arthroplasty	Fernandez,M.A.; Karthikeyan,S.; Wyse,M.; Foguet,P.	2014	Ann.R Coll.Surg.Engl.	no relevant outcomes to pico question
Clinical Implication of Diabetes Mellitus in Primary Total Hip Arthroplasty	Chun,Y.S.; Lee,S.H.; Lee,S.H.; Cho,Y.J.; Rhyu,K.H.	2014	Hip Pelvis.	unclear if infection outcome is specific to PJI
Part I: triggers for an evidence based practice project: managing peri-operative hyperglycemia in total hip and total knee replacement surgeries	Dolor,M.; Hadano,M.; Latimer,R.W.	2014	Nurs.Clin.North Am.	infection outcome not specific to pji
Is wound drainage necessary in hip arthroplasty? A meta-analysis of randomized controlled trials	Chen,Z.Y.; Gao,Y.; Chen,W.; Li,X.; Zhang,Y.Z.	2014	Eur.J.Orthop.Surg.Traumatol.	Meta analysis
Risk versus reward: total joint arthroplasty outcomes after various solid organ transplantations	Ledford,C.K.; Watters,T.S.; Wellman,S.S.; Attarian,D.E.; Bolognesi,M.P.	2014	J.Arthroplasty	retrospective case series
Decreased infection rates following total joint arthroplasty in a large county run teaching hospital: a single surgeon's experience and possible solution	Gottschalk,M.B.; Johnson,J.P.; Sadlack,C.K.; Mitchell,P.M.	2014	J.Arthroplasty	unclear if infection outcome is specific to pji.
Risk stratified usage of antibiotic-loaded bone cement for primary total knee arthroplasty: short term infection outcomes with a standardized cement protocol	Qadir,R.; Sidhu,S.; Ochsner,J.L.; Meyer,M.S.; Chimento,G.F.	2014	J.Arthroplasty	

Preoperative skin disinfection methodologies for reducing prosthetic joint infections	Banerjee,S.; Kapadia,B.H.; Mont,M.A.	2014	J.Knee Surg.	review
The effect of triclosan coated sutures on rate of surgical site infection after hip and knee replacement: a protocol for a double-blind randomised controlled trial	Sprowson,A.P.; Jensen,C.D.; Parsons,N.; Partington,P.; Emmerson,K.; Carluke,I.; Asaad,S.; Pratt,R.; Muller,S.; Reed,M.R.	2014	BMC Musculoskelet.Disord.	Not completed article- No results section
Comparison of restrictive and liberal transfusion strategy on postoperative delirium in aged patients following total hip replacement: a preliminary study	Fan,Y.X.; Liu,F.F.; Jia,M.; Yang,J.J.; Shen,J.C.; Zhu,G.M.; Zhu,S.H.; Li,W.Y.; Yang,J.J.; Ji,M.H.	2014	Arch.Gerontol.Geriatr.	not relevant to pico question
Sonication of antibiotic spacers predicts failure during two-stage revision for prosthetic knee and hip infections	Nelson,C.L.; Jones,R.B.; Wingert,N.C.; Foltzer,M.; Bowen,T.R.	2014	Clin.Orthop.Relat.Res.	not relevant test to pico question
When does hip fracture surgery fail?	Tsang,S.T.; Aitken,S.A.; Golay,S.K.; Silverwood,R.K.; Biant,L.C.	2014	Injury	not specific to arthroplasty patients
All-cause in-hospital complications and urinary tract infections increased in obese patients undergoing total knee arthroplasty	Abdel,M.P.; Ast,M.P.; Lee,Y.Y.; Lyman,S.; Gonzalez,Della,V	2014	J.Arthroplasty	unclear if infection outcome is specific to PJI
Bariatric surgery prior to total joint arthroplasty may not provide dramatic improvements in post-arthroplasty surgical outcomes	Inacio,M.C.; Paxton,E.W.; Fisher,D.; Li,R.A.; Barber,T.C.; Singh,J.A.	2014	J.Arthroplasty	only descriptive data presented due to low event rates.
Effects of dexamethasone on local infiltration analgesia in total knee arthroplasty: a randomized controlled trial	Ikeuchi,M.; Kamimoto,Y.; Izumi,M.; Fukunaga,K.; Aso,K.; Sugimura,N.; Yokoyama,M.; Tani,T.	2014	Knee Surg.Sports Traumatol.Arthrosc.	doesn't answer pico question. steroids given intraoperatively instead of preoperatively
The effect of body mass index on the risk of post-operative complications during the 6 months following total hip replacement or total knee replacement surgery	Wallace,G.; Judge,A.; Prieto-Alhambra,D.; de,Vries F.; Arden,N.K.; Cooper,C.	2014	Osteoarthritis Cartilage	infection outcome not specific to pji
Surgical Site Infection After Arthroplasty: Comparative Effectiveness of Prophylactic Antibiotics: Do Surgical Care Improvement Project Guidelines Need to Be Updated?	Ponce,B.; Raines,B.T.; Reed,R.D.; Vick,C.; Richman,J.; Hawn,M.	2014	J.Bone Joint Surg.Am.	infection outcome not specific to pji

Blood management strategies for total knee arthroplasty	Levine,B.R.; Haughom,B.; Strong,B.; Hellman,M.; Frank,R.M.	2014	J.Am.Acad.Orthop.Surg.	narrative review
Clostridium difficile is common in patients with postoperative diarrhea after hip and knee arthroplasty	Tokarski,A.T.; Karam,J.A.; Zmistowski,B.; Deirmengian,C.A.; Deirmengian,G.K.	2014	J.Arthroplasty	not specific to tja, since some patients had hemiarthroplasty
Mortality following revision total knee arthroplasty: a matched cohort study of septic versus aseptic revisions	Choi,H.R.; Bedair,H.	2014	J.Arthroplasty	not relevant. studies septic revision as a risk factor for mortality, instead of studying risk factors for septic revision
The risk of surgical site infection and re-admission in obese patients undergoing total joint replacement who lose weight before surgery and keep it off post-operatively	Inacio,M.C.; Kritz-Silverstein,D.; Raman,R.; Macera,C.A.; Nichols,J.F.; Shaffer,R.A.; Fithian,D.C.	2014	Bone Joint J.	this analysis uses a subgroup of data from a different study by the same author. The other study was included, and was rated sufficient quality, but this subgroup analysis of patients who maintained weightloss after surgery was appraised as inadequate quality due to protopathic bias.
Association of obesity with inflammation and pain after total hip arthroplasty	Motaghedi,R.; Bae,J.J.; Memtsoudis,S.G.; Kim,D.H.; Beathe,J.C.; Paroli,L.; YaDeau,J.T.; Gordon,M.A.; Maalouf,D.B.; Lin,Y.; Ma,Y.; Cunningham-Rundles,S.; Liu,S.S.	2014	Clin.Orthop.Relat.Res.	inflammatory response outcome not specific to pji
Superficial wound closure complications with barbed sutures following knee arthroplasty	Campbell,A.L.; Patrick,D.A.,Jr.; Liabaud,B.; Geller,J.A.	2014	J.Arthroplasty	not all patients had total joint arthroplasty. some had partial arthroplasty
Revision total knee arthroplasty in the young patient: is there trouble on the horizon?	Aggarwal,V.K.; Goyal,N.; Deirmengian,G.; Rangavajulla,A.; Parvizi,J.; Austin,M.S.	2014	J.Bone Joint Surg.Am.	while overall revision risk outcome was higher quality due to multivariate analysis, the septic failure outcome was very low quality due to lack of adjustment for confounders and incomplete reporting of outcome.
Comparison of bacterial results from conventional cultures of the periprosthetic membrane and the synovial or pseudocapsule during hip revision arthroplasty	Munoz-Mahamud,E.; Soriano,A.; Combalia,A.; Medrano,C.; Bosch,J.; Garcia,S.; Bori,G.	2014	Arch.Orthop.Trauma Surg.	Not relevant to criteria

Total hip replacement in HIV-positive patients	Graham,S.M.; Lubega,N.; Mkandawire,N.; Harrison,W.J.	2014	Bone Joint J.	retrospective
Infectious prosthetic hip joint loosening: bacterial species involved in its aetiology and their antibiotic resistance profiles against antibiotics recommended for the therapy of implant-associated infections	Bogut,A.; Niedzwiadek,J.; Strzelec-Nowak,D.; Blacha,J.; Mazurkiewicz,T.; Marczynski,W.; Koziol-Montewka,M.	2014	New Microbiol.	<25 patients per group and insufficient data to answe rpico question
Control strategies to prevent total hip replacement-related infections: a systematic review and mixed treatment comparison	Zheng,H.; Barnett,A.G.; Merollini,K.; Sutton,A.; Cooper,N.; Berendt,T.; Wilson,J.; Graves,N.	2014	BMJ Open	network meta analysis
Increased surgeon experience with rheumatoid arthritis reduces the risk of complications following total joint arthroplasty	Ravi,B.; Croxford,R.; Austin,P.C.; Hollands,S.; Paterson,J.M.; Bogoch,E.; Kreder,H.; Hawker,G.A.	2014	Arthritis Rheumatol.	local complications outcome not specific to pji
Is there any benefit in pre-operative urinary analysis before elective total joint replacement?	Bouvet,C.; Lubbeke,A.; Bandi,C.; Pagani,L.; Stern,R.; Hoffmeyer,P.; Uckay,I.	2014	Bone Joint J.	infection outcome not specific to pji
Industrially prefabricated cement spacers: do vancomycin- and gentamicin-impregnated spacers offer any advantage?	Corona,P.S.; Barro,V.; Mendez,M.; Caceres,E.; Flores,X.	2014	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study
Knee osteoarthritis and role for surgical intervention: lessons learned from randomized clinical trials and population-based cohorts	Buchbinder,R.; Richards,B.; Harris,I.	2014	Curr Opin.Rheumatol.	literature review
A multidisciplinary enhanced recovery programme allows discharge within two days of total hip replacement; three- to five-year results of 100 patients	Dawson-Bowling,S.J.; Jha,S.; Chettiar,K.K.; East,D.J.; Gould,G.C.; Apthorp,H.D.	2014	Hip Int.	does not look at risk factors for infection
Depression is associated with early postoperative outcomes following total joint arthroplasty: a nationwide database study	Browne,J.A.; Sandberg,B.F.; D'Apuzzo,M.R.; Novicoff,W.M.	2014	J.Arthroplasty	infection outcome not specific to pji
Risk factors for superficial wound complications in hip and knee arthroplasty	Carroll,K.; Dowsey,M.; Choong,P.; Peel,T.	2014	Clin.Microbiol.Infect.	cannot be used for pico question asking if previous infection increases pji risk becuase variable was superficial wound complications, which was a composite of ssi or wound oozing

Two-stage treatment of infected total knee arthroplasty: two to thirteen year experience using an articulating preformed spacer	Castelli,C.C.; Gotti,V.; Ferrari,R.	2014	Int.Orthop.	not relevant. patients already had joint infection at start of the study
Prevention of late PJI	Chen,A.; Haddad,F.; Lachiewicz,P.; Bolognesi,M.; Cortes,L.E.; Franceschini,M.; Gallo,J.; Glynn,A.; Gonzalez,Della,V; Gahramanov,A.; Khatod,M.; Lazarinis,S.; Lob,G.; Nana,A.; Ochsner,P.; Tuncay,I.; Winkler,T.; Zeng,Y.	2014	J.Arthroplasty	review
Complications of perioperative warfarin therapy in total knee arthroplasty	Simpson,P.M.; Brew,C.J.; Whitehouse,S.L.; Crawford,R.W.; Donnelly,B.J.	2014	J.Arthroplasty	the risk factor is perioperative therapeutic anticoagulation in perioperative period, which includes 17 patients getting anticoagulation post-operatively due to VTE. excluded because not all patients in anticoagulation state prior to surgery, which makes patient population not relevant to pico question
Correlation of aspiration results with periprosthetic sepsis in revision total hip arthroplasty	Chalmers,P.N.; Sporer,S.M.; Levine,B.R.	2014	J.Arthroplasty	not relevant comparison to pico. demographic characteristics compared between septic and aseptic revision, instead of comparing patients revised for infection to all patients not revised for infection.
Mid-term outcomes in HIV-positive patients after primary total hip or knee arthroplasty	Lin,C.A.; Takemoto,S.; Kandemir,U.; Kuo,A.C.	2014	J.Arthroplasty	less than 25 patients per group
Rheumatoid arthritis vs osteoarthritis in patients receiving total knee arthroplasty: perioperative outcomes	Stundner,O.; Danninger,T.; Chiu,Y.L.; Sun,X.; Goodman,S.M.; Russell,L.A.; Figgie,M.; Mazumdar,M.; Memtsoudis,S.G.	2014	J.Arthroplasty	infection outcome not specific to pji
Risk factors for failure of locked plate fixation of distal femur fractures: an analysis of 335 cases	Ricci,W.M.; Streubel,P.N.; Morshed,S.; Collinge,C.A.; Nork,S.E.; Gardner,M.J.	2014	J.Orthop.Trauma	non-arthroplasty patient population

Very-short-term perioperative intravenous iron administration and postoperative outcome in major orthopedic surgery: a pooled analysis of observational data from 2547 patients	Munoz,M.; Gomez-Ramirez,S.; Cuenca,J.; Garcia-Erce,J.A.; Iglesias-Aparicio,D.; Haman-Alcober,S.; Ariza,D.; Naveira,E.	2014	Transfusion	individual patient data pooled meta-analysis.
Dental disease and periprosthetic joint infection	Young,H.; Hirsh,J.; Hammerberg,E.M.; Price,C.S.	2014	J.Bone Joint Surg.Am.	narrative review
Increased release time of antibiotics from bone allografts through a novel biodegradable coating	Hornyak,I.; Madacsi,E.; Kalugyer,P.; Vacz,G.; Horvathy,D.B.; Szendroi,M.; Han,W.; Lacza,Z.	2014	Biomed Res.Int.	In vitro study
Application of temporarily functional antibiotic-containing bone cement prosthesis in revision hip arthroplasty	Liu,K.; Zheng,J.; Jin,Y.; Zhao,Y.Q.	2014	Eur.J.Orthop.Surg.Traumatol.	not relevant. patients already had joint infection at start of the study.
Fibrosis in hepatitis C patients predicts complications after elective total joint arthroplasty	Orozco,F.; Post,Z.D.; Baxi,O.; Miller,A.; Ong,A.	2014	J.Arthroplasty	inadequate quality due to lack of confounding adjustment for comorbidities and unclear outcome defintions
Thirty-day postoperative complications and mortality following total knee arthroplasty: incidence and risk factors among a national sample of 15,321 patients	Belmont,P.J.,Jr.; Goodman,G.P.; Waterman,B.R.; Bader,J.O.; Schoenfeld,A.J.	2014	J.Bone Joint Surg.Am.	outcomes not specific to PJI
Systematic review: the safety of intra-articular corticosteroid injection prior to total knee arthroplasty	Marsland,D.; Mumith,A.; Barlow,I.W.	2014	Knee	Systematic review
A systematic review and meta-analysis of antibiotic-impregnated bone cement use in primary total hip or knee arthroplasty	Wang,J.; Zhu,C.; Cheng,T.; Peng,X.; Zhang,W.; Qin,H.; Zhang,X.	2013	PLoS One	Systematic review
Two-stage revision total hip arthroplasty for periprosthetic infections using antibiotic-impregnated cement spacers of various types and materials	Uchiyama,K.; Takahira,N.; Fukushima,K.; Moriya,M.; Yamamoto,T.; Minegishi,Y.; Sakai,R.; Itoman,M.; Takaso,M.	2013	ScientificWorldJournal.	not relevant. patients already had joint infection at start of the study
Are antibiotics necessary in hip arthroplasty with asymptomatic bacteriuria? Seeding risk with/without treatment	Cordero-Ampuero,J.; Gonzalez-Fernandez,E.; Martinez-Velez,D.; Esteban,J.	2013	Clin.Orthop.Relat.Res.	cannot be used for modifiable risk factor optimization PICO, since treatment for asymptomatic bacteriuria began after completion of the surgery.

Antibiotic prophylaxis for hip fracture surgery: three-dose cefuroxime versus single-dose gentamicin and amoxicillin	Jettoo,P.; Jeavons,R.; Siddiqui,B.; O'Brien,S.	2013	J.Orthop.Surg.(Hong Kong)	patients did not have tja
Periprosthetic knee infection: ten strategies that work	Parvizi,J.; Cavanaugh,P.K.; Diaz-Ledezma,C.	2013	Knee Surg.Relat.Res.	narrative review
Risk factors for infection following total joint arthroplasty in rheumatoid arthritis	Somayaji,R.; Barnabe,C.; Martin,L.	2013	Open Rheumatol.J.	infection outcome not specific to pji
Adverse peri-operative outcomes following elective total hip replacement in diabetes mellitus: a systematic review and meta-analysis of cohort studies	Tsang,S.T.; Gaston,P.	2013	Bone Joint J.	meta analysis
Characteristics of prosthetic joint infections leading to bacteremia: a case-control study	Dauchy,F.A.; Dutronc,H.; Lawson-Ayayi,S.; Wirth,G.; Hofmann,P.; de,Barbeyrac B.; Fabre,T.; Dupon,M.	2013	Scand.J.Infect.Dis.	Less than 25 in each group
Outcomes of cementless primary THA for osteonecrosis in HIV-infected patients	Issa,K.; Naziri,Q.; Rasquinha,V.; Maheshwari,A.V.; Delanois,R.E.; Mont,M.A.	2013	J.Bone Joint Surg.Am.	inadequate quality, due to use of different inclusion criteria used between HIV and non HIV cohorts, and incomplete reporting of deep infection outcome
Complication rates after hip or knee arthroplasty in morbidly obese patients	Friedman,R.J.; Hess,S.; Berkowitz,S.D.; Homering,M.	2013	Clin.Orthop.Relat.Res.	infection outcome not specific to pji
Two-stage arthroplasty for prosthetic joint infection: a systematic review of acute kidney injury, systemic toxicity and infection control	Luu,A.; Syed,F.; Raman,G.; Bhalla,A.; Muldoon,E.; Hadley,S.; Smith,E.; Rao,M.	2013	J.Arthroplasty	systematic review
Incidence of bacterial contamination in primary THA and combined hardware removal: analysis of preoperative aspiration and intraoperative biopsies	Klatte,T.O.; Meinicke,R.; O'Loughlin,P.; Rueger,J.M.; Gehrke,T.; Kendoff,D.	2013	J.Arthroplasty	does not included arthroplasty patients
Use of static or articulating spacers for infection following total knee arthroplasty: a systematic literature review	Voleti,P.B.; Baldwin,K.D.; Lee,G.C.	2013	J.Bone Joint Surg.Am.	Systematic review
Surgical site infection prevention following total hip arthroplasty in Australia: a cost-effectiveness analysis	Merollini,K.M.; Crawford,R.W.; Whitehouse,S.L.; Graves,N.	2013	Am.J.Infect.Control	Cost effectiveness analysis
Preemptive low-dose dexamethasone reduces postoperative emesis and pain	Koh,I.J.; Chang,C.B.; Lee,J.H.; Jeon,Y.T.; Kim,T.K.	2013	Clin.Orthop.Relat.Res.	not relevant. injections given intravenously instead of intraarticularly

after TKA: a randomized controlled study				
Revision of infected total knee arthroplasty: two-stage reimplantation using an antibiotic-impregnated static spacer	Silvestre,A.; Almeida,F.; Renovell,P.; Morante,E.; Lopez,R.	2013	Clin.Orthop.Surg.	not relevant. included patients who already had joint infection
Comparison of one-stage revision with antibiotic cement versus two-stage revision results for infected total hip arthroplasty	Choi,H.R.; Kwon,Y.M.; Freiberg,A.A.; Malchau,H.	2013	J.Arthroplasty	not relevant. patients already had joint infection at start of the study
Multiple cultures and extended incubation for hip and knee arthroplasty revision: impact on clinical care	DeHaan,A.; Huff,T.; Schabel,K.; Doung,Y.C.; Hayden,J.; Barnes,P.	2013	J.Arthroplasty	Not relevant to criteria
Preoperative decolonization effective at reducing staphylococcal colonization in total joint arthroplasty patients	Chen,A.F.; Heyl,A.E.; Xu,P.Z.; Rao,N.; Klatt,B.A.	2013	J.Arthroplasty	no relevant outcomes. outcome was mrsa colinization, and not infection
Infection rate following total joint arthroplasty in the HIV population	Capogna,B.M.; Lovy,A.; Blum,Y.; Kim,S.J.; Felsen,U.R.; Geller,D.S.	2013	J.Arthroplasty	inadequate quality due to different follow up lengths, and because there were too few events to allow for adjustment for important confounders
Diagnostic value of triple-phase bone scintigraphy for the diagnosis of infection around antibiotic-impregnated cement spacers	Ikeuchi,M.; Okanoue,Y.; Izumi,M.; Fukuda,G.; Aso,K.; Sugimura,N.; Kawakami,T.; Tani,T.	2013	Springerplus.	diagnostic test done in patients in which infected prosthesis had already been removed
Prosthetic joint infection in patients with rheumatoid arthritis: an outcome analysis compared with controls	Hsieh,P.H.; Huang,K.C.; Shih,H.N.	2013	PLoS One	was a study of infection treatment, instead of infrction prevention
Prosthetic joint-associated infections treated with DAIR (debridement, antibiotics, irrigation, and retention): analysis of risk factors and local antibiotic carriers in 91 patients	Kuiper,J.W.; Vos,S.J.; Saouti,R.; Vergroesen,D.A.; Graat,H.C.; Debets-Ossenkopp,Y.J.; Peters,E.J.; Nolte,P.A.	2013	Acta Orthop.	patients not treated with arthroplasty
Early prosthetic hip joint infection treated with debridement, prosthesis retention and biofilm-active antibiotics: functional outcomes, quality of life and complications	Aboltins,C.; Dowsey,M.M.; Peel,T.; Lim,W.K.; Parikh,S.; Stanley,P.; Choong,P.F.	2013	Intern.Med.J.	for comorbidity risk factors less than 25 patients per group. also it is unclear if table 1 could be used as a case control for the pico question, since the purpose of the study was to measure outcomes after PJI treatment, and it is unclear if measurements in the case group

				represent measurements taken before pji treatment, or before the initial arthroplasty
Timing of surgical antibiotic prophylaxis and the risk of surgical site infection	Hawn,M.T.; Richman,J.S.; Vick,C.C.; Deierhoi,R.J.; Graham,L.A.; Henderson,W.G.; Itani,K.M.	2013	JAMA Surg.	infection outcome not specific to pji
"Salvage microbiology": detection of bacteria directly from clinical specimens following initiation of antimicrobial treatment	Farrell,J.J.; Sampath,R.; Ecker,D.J.; Bonomo,R.A.	2013	PLoS One	not sepcific to hip and knee pji
Preventing surgical site infection: preoperative bathing, engaging patients and caregivers	Froimson,M.I.; Olivo,K.; Schill,M.; Horrigan,M.A.	2013	Am.J.Orthop.(Belle.Mead.NJ.)	review
Preventing surgical site infection: preoperative bathing, why is it so important?	McCann,P.D.	2013	Am.J.Orthop.(Belle.Mead.NJ.)	review
Relations between long-term glycemic control and postoperative wound and infectious complications after total knee arthroplasty in type 2 diabetics	Han,H.S.; Kang,S.B.	2013	Clin.Orthop.Surg.	for the multivariate analysis: wound complications includes superficial SSI's. for the deep infection outcome: no multivariate analysis was done, which decreased the study quality to very low for this outcome
Microbiological culture findings of the femoral heads as a prognostic factor in the total hip replacement surgery	Phuong,D.T.; Park,K.S.; Hwang,S.Y.; Lee,D.H.; Yoon,T.R.	2013	Clin.Orthop.Surg.	not relevant. not a diagnostic study of patients suspected of PJI, but rather a prognostic study evaluating if a femoral head test if predictive of future infection
The effects of 'old' red blood cell transfusion on mortality and morbidity in elderly patients with hip fractures--a retrospective study	Kadar,A.; Chechik,O.; Katz,E.; Blum,I.; Meghiddo,G.; Salai,M.; Steinberg,E.; Sternheim,A.	2013	Injury	not specific to hip and knee arthroplasty
Periprosthetic joint infection with negative culture results: clinical characteristics and treatment outcome	Choi,H.R.; Kwon,Y.M.; Freiberg,A.A.; Nelson,S.B.; Malchau,H.	2013	J.Arthroplasty	insufficient data to answer pico question. information about timing of antibiotic administration was incomplete for a large number of patients. for diagnostic, only PJI patients were included, so there is insufficient data for a 2x2 table and patient spectum would

				not be representative
Chlorhexidine reduces infections in knee arthroplasty	Johnson,A.J.; Kapadia,B.H.; Daley,J.A.; Molina,C.B.; Mont,M.A.	2013	J.Knee Surg.	unclear if infection outcome included superficial infections
Predictive value of inflammatory markers for irrigation and debridement of acute TKA infection	Stryker,L.S.; Abdel,M.P.; Hanssen,A.D.	2013	Orthopedics	for risk factors: not all patients got arthroplasty. for diagnostic: insufficient data for 2x2 table
Risk factors for deep infection after total knee arthroplasty: a meta-analysis	Chen,J.; Cui,Y.; Li,X.; Miao,X.; Wen,Z.; Xue,Y.; Tian,J.	2013	Arch.Orthop.Trauma Surg.	Meta analysis
Elective hip and knee arthroplasty and the effect of rivaroxaban and enoxaparin thromboprophylaxis on wound healing	Sindali,K.; Rose,B.; Soueid,H.; Jeer,P.; Saran,D.; Shrivastava,R.	2013	Eur.J.Orthop.Surg.Traumatol.	doesn't answer pico question, since both groups given vte prophylaxis.
Medical and psychological comorbidity predicts poor pain outcomes after total knee arthroplasty	Singh,J.A.; Lewallen,D.G.	2013	Rheumatology (Oxford)	doesn't look at risk factors for PJI
Bacteriology swabs in primary total knee arthroplasty	Haenle,M.; Podbielski,A.; Ellenrieder,M.; Mundt,A.; Krentz,H.; Mittelmeier,W.; Skripitz,R.	2013	GMS.Hyg.Infect.Control	not relevent test. study evaluates if swabs during primary arthroplaty predict pji.
Which is the better method of wound closure in patients undergoing hip or knee replacement surgery: sutures or skin clips?	Dignon,A.; Arnett,N.	2013	J.Perioper.Pract.	Literary review
Sex and risk of hip implant failure: assessing total hip arthroplasty outcomes in the United States	Inacio,M.C.; Ake,C.F.; Paxton,E.W.; Khatod,M.; Wang,C.; Gross,T.P.; Kaczmarek,R.G.; Marinac-Dabic,D.; Sedrakyan,A.	2013	JAMA Intern.Med.	doesn't answer pico question. results for confounding variables relevent to this pico question were not presented
Infection prevention methodologies for lower extremity total joint arthroplasty	Kapadia,B.H.; Pivec,R.; Johnson,A.J.; Issa,K.; Naziri,Q.; Daley,J.A.; Mont,M.A.	2013	Expert Rev.Med.Devices	Systematic review
Cemented total hip arthroplasty in rheumatoid arthritis. A systematic review of the literature	Zwartele,R.; Poll,R.G.	2013	Hip Int.	Systematic review

A comparison of complications requiring return to theatre in hip and knee arthroplasty patients taking enoxaparin versus rivaroxaban for thromboprophylaxis	Chahal,G.S.; Saithna,A.; Brewster,M.; Gilbody,J.; Lever,S.; Khan,W.S.; Foguet,P.	2013	Ortop.Traumatol.Rehabil.	does not answer anti-coagulation state prognostic factor question, since thromboprophylaxis treatment was started following surgery
Peri-operative interventions producing better functional outcomes and enhanced recovery following total hip and knee arthroplasty: an evidence-based review	Ibrahim,M.S.; Khan,M.A.; Nizam,I.; Haddad,F.S.	2013	BMC Med.	Commentary review
Continuous high-dose vancomycin combination therapy for methicillin-resistant staphylococcal prosthetic hip infection: a prospective cohort study	Dubee,V.; Zeller,V.; Lhotellier,L.; Kitzis,M.D.; Ziza,J.M.; Mamoudy,P.; Desplaces,N.	2013	Clin.Microbiol.Infect.	does not evaluate uninfected joint replacements
Estimating risk in Medicare patients with THA: an electronic risk calculator for periprosthetic joint infection and mortality	Bozic,K.J.; Ong,K.; Lau,E.; Berry,D.J.; Vail,T.P.; Kurtz,S.M.; Rubash,H.E.	2013	Clin.Orthop.Relat.Res.	insuffient data to answer pico questions about individual risk factors.
Complications related to therapeutic anticoagulation in total hip arthroplasty	McDougall,C.J.; Gray,H.S.; Simpson,P.M.; Whitehouse,S.L.; Crawford,R.W.; Donnelly,W.J.	2013	J.Arthroplasty	not relevant to anticoagulation risk factor pico, since risk factor was requiring anticoagulation after arthroplasty was already performed.
Articulating spacers for the treatment of infected total knee arthroplasty: effect of antibiotic combinations and concentrations	Nettrour,J.F.; Polikandriotis,J.A.; Bernasek,T.L.; Gustke,K.A.; Lyons,S.T.	2013	Orthopedics	not relevant. patients already had joint infection at start of the study
Risk factors for revision of primary total hip arthroplasty: a systematic review	Prokopetz,J.J.; Losina,E.; Bliss,R.L.; Wright,J.; Baron,J.A.; Katz,J.N.	2012	BMC Musculoskelet.Disord.	Systematic review
Impact of vancomycin surgical antibiotic prophylaxis on the development of methicillin-sensitive staphylococcus aureus surgical site infections: report from Australian Surveillance Data (VICNISS)	Bull,A.L.; Worth,L.J.; Richards,M.J.	2012	Ann.Surg.	infection outcome not specific to pji
A systematic review and meta-analysis comparing complications following total joint arthroplasty for rheumatoid arthritis versus for osteoarthritis	Ravi,B.; Escott,B.; Shah,P.S.; Jenkinson,R.; Chahal,J.; Bogoch,E.; Kreder,H.; Hawker,G.	2012	Arthritis Rheum.	meta-analysis
Choice and doses of antibacterial agents for cement spacers in treatment of	Iarikov,D.; Demian,H.; Rubin,D.; Alexander,J.;	2012	Clin.Infect.Dis.	Systematic review

prosthetic joint infections: review of published studies	Nambiar,S.			
A gentamicin-releasing coating for cementless hip prostheses-Longitudinal evaluation of efficacy using in vitro bio-optical imaging and its wide-spectrum antibacterial efficacy	Neut,D.; Dijkstra,R.J.; Thompson,J.I.; van der Mei,H.C.; Busscher,H.J.	2012	J.Biomed Mater.Res.A	in vitro
Two-stage revision of septic knee prosthesis with articulating knee spacers yields better infection eradication rate than one-stage or two-stage revision with static spacers	Romano,C.L.; Gala,L.; Logoluso,N.; Romano,D.; Drago,L.	2012	Knee Surg.Sports Traumatol.Arthrosc.	Systematic review
Randomized controlled trial of the safety and efficacy of Daptomycin versus standard-of-care therapy for management of patients with osteomyelitis associated with prosthetic devices undergoing two-stage revision arthroplasty	Byren,I.; Rege,S.; Campanaro,E.; Yankelev,S.; Anastasiou,D.; Kuropatkin,G.; Evans,R.	2012	Antimicrob.Agents Chemother.	not relevant. studied antibiotics for treatment of pji, and not prevention of pji
Short-course antibiotics for prosthetic joint infections treated with prosthesis retention	Puhto,A.P.; Puhto,T.; Syrjala,H.	2012	Clin.Microbiol.Infect.	was a study of treatment of PJI's, instead of PJI prophylaxis
Total hip arthroplasty in HIV-infected patients: a retrospective, controlled study	Tornero,E.; Garcia,S.; Larrousse,M.; Gallart,X.; Bori,G.; Riba,J.; Rios,J.; Gatell,J.; Martinez,E.	2012	HIV Med.	less than 25 patients per group
The influence of obesity on the complication rate and outcome of total knee arthroplasty: a meta-analysis and systematic literature review	Kerkhoffs,G.M.; Servien,E.; Dunn,W.; Dahm,D.; Bramer,J.A.; Haverkamp,D.	2012	J.Bone Joint Surg.Am.	systematic review
Does a prefabricated gentamicin-impregnated, load-bearing spacer control periprosthetic hip infection?	Degen,R.M.; Davey,J.R.; Davey,J.R.; Howard,J.L.; McCalden,R.W.; Naudie,D.D.	2012	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study
Prosthetic joint infections due to Staphylococcus aureus and coagulase-negative staphylococci	Tornero,E.; Garcia-Oltra,E.; Garcia-Ramiro,S.; Martinez-Pastor,J.C.; Bosch,J.; Climent,C.; Morata,L.; Camacho,P.; Mensa,J.; Soriano,A.	2012	Int.J.Artif.Organs	patients treated with debridement for infection

Results of peri-articular steroid injection in the treatment of chronic extra-articular pain after total knee arthroplasty	Chaiyakit,P.; Meknavin,S.; Pakawattana,V.	2012	J.Med.Assoc.Thai.	not relevant. patients given injections after surgery
Wound complications following rivaroxaban administration: a multicenter comparison with low-molecular-weight heparins for thromboprophylaxis in lower limb arthroplasty	Jameson,S.S.; Rymaszewska,M.; Hui,A.C.; James,P.; Serrano-Pedraza,I.; Muller,S.D.	2012	J.Bone Joint Surg.Am.	doesn't answer pico question since both groups got thromboprophylaxis
Preventing surgical site infection in haemophilia patients undergoing total knee arthroplasty	Rodriguez-Merchan,E.C.	2012	Blood Coagul.Fibrinolysis	systematic review
Review article: Risk factors of infection following total knee arthroplasty	Rodriguez-Merchan,E.C.	2012	J.Orthop.Surg.(Hong Kong)	Systematic review
A prospective randomised study comparing the jubilee dressing method to a standard adhesive dressing for total hip and knee replacements	Burke,N.G.; Green,C.; McHugh,G.; McGolderick,N.; Kilcoyne,C.; Kenny,P.	2012	J.Tissue Viability	Not relevant to criteria
The efficacy of a thrombin-based hemostatic agent in unilateral total knee arthroplasty: a randomized controlled trial	Kim,H.J.; Fraser,M.R.; Kahn,B.; Lyman,S.; Figgie,M.P.	2012	J.Bone Joint Surg.Am.	not relevant to pico question, since the treatment is not thromboprophylaxis
Application of individually performed acrylic cement spacers containing 5% of antibiotic in two-stage revision of hip and knee prosthesis due to infection	Babiak,I.	2012	Pol.Orthop.Traumatol.	not relevant. patients already had joint infection at start of the study
Septic arthritis of the knee: the use and effect of antibiotics prior to diagnostic aspiration	Hindle,P.; Davidson,E.; Biant,L.C.	2012	Ann.R Coll.Surg.Engl.	less than 25 patients examined for pji. a majority of patients examined for septic arthritis in the native knee joint
Admission Norton scale scores (ANSS) and postoperative complications following hip fracture surgery in the elderly	Gold,A.; Sever,R.; Lerman,Y.; Salai,M.; Justo,D.	2012	Arch.Gerontol.Geriatr.	not specific to hip and knee arthroplasty
Deep infection after hip fracture surgery: predictors of early mortality	Duckworth,A.D.; Phillips,S.A.; Stone,O.; Moran,M.; Breusch,S.J.; Biant,L.C.	2012	Injury	not all patients had arthroplasty
Lower limb joint replacement in rheumatoid arthritis	Clement,N.D.; Breusch,S.J.; Biant,L.C.	2012	J.Orthop.Surg.Res.	Review
Sutures versus staples for wound closure in orthopaedic surgery: a randomized	Shantz,J.A.; Vernon,J.; Leiter,J.; Morshed,S.;	2012	BMC Musculoskelet.Disord.	Not completed article- No results section

controlled trial	Stranges,G.			
Total hip arthroplasty after ipsilateral intra-articular steroid injection: 8 years follow up	McMahon,S.E.; Lovell,M.E.	2012	Acta Orthop.Belg.	retrospective case series
Monoblock hemiarthroplasties for femoral neck fractures--a part of orthopaedic history? Analysis of national registration of hemiarthroplasties 2005-2009	Rogmark,C.; Leonardsson,O.; Garellick,G.; Karrholm,J.	2012	Injury	not relevant. compares reoperations rates between implant types
Acute kidney injury after placement of an antibiotic-impregnated cement spacer during revision total knee arthroplasty	Menge,T.J.; Koethe,J.R.; Jenkins,C.A.; Wright,P.W.; Shinar,A.A.; Miller,G.G.; Holt,G.E.	2012	J.Arthroplasty	not relevant. patients already had joint infection at start of the study
Influence of laminar airflow on prosthetic joint infections: a systematic review	Gastmeier,P.; Breier,A.C.; Brandt,C.	2012	J.Hosp.Infect.	Systematic review
Perioperative clopidogrel and postoperative events after hip and knee arthroplasties	Nandi,S.; Aghazadeh,M.; Talmo,C.; Robbins,C.; Bono,J.	2012	Clin.Orthop.Relat.Res.	less than 25 patients per group
Does BMI affect perioperative complications following total knee and hip arthroplasty?	Suleiman,L.I.; Ortega,G.; Ong'uti,S.K.; Gonzalez,D.O.; Tran,D.D.; Onyike,A.; Turner,P.L.; Fullum,T.M.	2012	J.Surg.Res.	infection outcome not specific to pji
Safety of total hip replacement following an intra-articular steroid hip injection--an audit	Sankar,B.; Seneviratne,S.; Radha,S.; Rajeev,A.; Banaszkiewicz,P.	2012	Acta Orthop.Belg.	retrospective case series
Cefuroxime-impregnated cement and systemic cefazolin for 1 week in primary total knee arthroplasty: an evaluation of 2700 knees	Chiang,C.C.; Chiu,F.Y.	2012	J.Chin.Med.Assoc.	retrospective case series
Infected total hip arthroplasty revision: one- or two-stage procedure?	Klouche,S.; Leonard,P.; Zeller,V.; Lhotellier,L.; Graff,W.; Leclerc,P.; Mamoudy,P.; Sariali,E.	2012	Orthop.Traumatol.Surg.Res.	was a study of treatment of PJI's, instead of PJI prevention
Meningitis or epidural abscesses after neuraxial block for removal of infected hip or knee prostheses	Gritsenko,K.; Marcello,D.; Liguori,G.A.; Jules-Elysee,K.; Memtsoudis,S.G.	2012	Br.J.Anaesth.	does not look at risk factors for pji

Thromboprophylaxis, bleeding and post-operative prosthetic joint infection in total hip and knee arthroplasty: a comprehensive literature review	Kwong,L.M.; Kistler,K.D.; Mills,R.; Wildgoose,P.; Klaskala,W.	2012	Expert Opin.Pharmacother.	systematic review
Diagnosis and treatment of peri-prosthetic infections in total hip replacement	Hudetz,D.; Rod,E.; Radic,A.; Ivkovic,A.	2012	Med.Glas.(Zenica.)	narative review
Role of diabetes type in perioperative outcomes after hip and knee arthroplasty in the United States	Viens,N.A.; Hug,K.T.; Marchant,M.H.; Cook,C.; Vail,T.P.; Bolognesi,M.P.	2012	J.Surg.Orthop.Adv.	doesn't answer pico question, since all patients were diabetic.
Treatment for periprosthetic infection with two-stage revision arthroplasty with a gentamicin loaded spacer. The clinical outcomes	Borowski,M.; Kusz,D.; Wojciechowski,P.; Cielinski,L.	2012	Ortop.Traumatol.Rehabil.	not relevant. patients already had joint infection at start of the study
Relative risk of different operations for medial compartment osteoarthritis of the knee	Sikorski,J.M.; Sikorska,J.Z.	2011	Orthopedics	systematic review
Outcome of cefazolin prophylaxis for total knee arthroplasty at an institution with high prevalence of methicillin-resistant Staphylococcus aureus infection	Song,K.H.; Kang,Y.M.; Sin,H.Y.; Yoon,S.W.; Seo,H.K.; Kwon,S.; Shin,M.J.; Chang,C.B.; Kim,T.K.; Kim,H.B.	2011	Int.J.Infect.Dis.	infection outcome not specific to pji
A comparison of wound closure techniques for total knee arthroplasty	Eggers,M.D.; Fang,L.; Lionberger,D.R.	2011	J.Arthroplasty	Less than 25 in each group
Preoperative screening/decolonization for Staphylococcus aureus to prevent orthopedic surgical site infection: prospective cohort study with 2-year follow-up	Rao,N.; Cannella,B.A.; Crossett,L.S.; Yates,A.J.,Jr.; McGough,R.L.,III; Hamilton,C.W.	2011	J.Arthroplasty	number of deep infections not reported for preintervention period, so it doesn't answer pico question.
Efficacy and safety of iron supplementation for the elderly patients undergoing hip or knee surgery: a meta-analysis of randomized controlled trials	Yang,Y.; Li,H.; Li,B.; Wang,Y.; Jiang,S.; Jiang,L.	2011	J.Surg.Res.	Meta analysis
Incidence of infectious complications in hip and knee arthroplasties in rheumatoid arthritis and osteoarthritis patients	da Cunha,B.M.; de Oliveira,S.B.; Santos-Neto,L.	2011	Rev.Bras Reumatol.	inadequate quality due to the event rate being too small for a multivariate model and the use of different inclusion criteria for OA and RA patients
Laminar airflow ceiling size: no impact on infection rates following hip and knee prosthesis	Breier,A.C.; Brandt,C.; Sohr,D.; Geffers,C.; Gastmeier,P.	2011	Infect.Control Hosp.Epidemiol.	Not relevant to criteria

Forced-air warming and ultra-clean ventilation do not mix: an investigation of theatre ventilation, patient warming and joint replacement infection in orthopaedics	McGovern,P.D.; Albrecht,M.; Belani,K.G.; Nachtsheim,C.; Partington,P.F.; Carluke,I.; Reed,M.R.	2011	J.Bone Joint Surg.Br.	Not relevant to criteria
Intra-articular hip injection: does pain relief correlate with radiographic severity of osteoarthritis?	Deshmukh,A.J.; Panagopoulos,G.; Alizadeh,A.; Rodriguez,J.A.; Klein,D.A.	2011	Skeletal Radiol.	patients did not get total joint replacement
Intraoperative subcutaneous wound closing culture sample: a predicting factor for periprosthetic infection after hip- and knee-replacement?	Frank,C.B.; Adams,M.; Kroeber,M.; Wentzensen,A.; Heppert,V.; Schulte-Bockholt,D.; Guehring,T.	2011	Arch.Orthop.Trauma Surg.	not relavent. evaluates whether culture samples in non-infected patients at the time of initial arthroplasty is predictive of future infection.
Smoking as a risk factor for short-term outcomes following primary total hip and total knee replacement in veterans	Singh,J.A.; Houston,T.K.; Ponce,B.A.; Maddox,G.; Bishop,M.J.; Richman,J.; Campagna,E.J.; Henderson,W.G.; Hawn,M.T.	2011	Arthritis Care Res.(Hoboken.)	infection outcome not specific to pji
Linezolid plus rifampin as a salvage therapy in prosthetic joint infections treated without removing the implant	Gomez,J.; Canovas,E.; Banos,V.; Martinez,L.; Garcia,E.; Hernandez-Torres,A.; Canteras,M.; Ruiz,J.; Medina,M.; Martinez,P.; Canovas,A.; Soriano,A.; Clavel,M.	2011	Antimicrob.Agents Chemother.	not relevant. patients already had joint infection at start of the study
Application of wound dressing Molndal technique in clean and potentially contamined postoperative wounds--initial comparative study	Marinovic,M.; Cicvaric,T.; Grzalja,N.; Bacic,G.; Radovic,E.	2011	Coll.Antropol.	Not relevant to criteria
Challenges in periprosthetic knee-joint infection	Sendi,P.; Zimmerli,W.	2011	Int.J.Artif.Organs	narrative review
Efficacy of debridement in hematogenous and early post-surgical prosthetic joint infections	Vilchez,F.; Martinez-Pastor,J.C.; Garcia-Ramiro,S.; Bori,G.; Tornero,E.; Garcia,E.; Mensa,J.; Soriano,A.	2011	Int.J.Artif.Organs	patients did not get arthroplasty
Group B streptococcus in prosthetic hip and knee joint-associated infections	Sendi,P.; Christensson,B.; Uckay,I.; Trampuz,A.; Achermann,Y.; Boggian,K.; Svensson,D.; Widerstrom,M.;	2011	J.Hosp.Infect.	not all patients got arthroplasty

	Zimmerli,W.			
Obesity in total hip arthroplasty--does it really matter? A meta-analysis	Haverkamp,D.; Klinkenbijl,M.N.; Somford,M.P.; Albers,G.H.; van der Vis,H.M.	2011	Acta Orthop.	meta-analysis
Outcome and predictors of treatment failure in total hip/knee prosthetic joint infections due to Staphylococcus aureus	Senneville,E.; Joulie,D.; Legout,L.; Valette,M.; Dezeque,H.; Beltrand,E.; Rosele,B.; d'Escrivan,T.; Loiez,C.; Caillaux,M.; Yazdanpanah,Y.; Maynou,C.; Migaud,H.	2011	Clin.Infect.Dis.	not all patients got arthroplasty
The use of a preformed spacer in two-stage revision of infected hip arthroplasties	D'Angelo,F.; Negri,L.; Binda,T.; Zatti,G.; Cherubino,P.	2011	Musculoskelet.Surg.	not relevant. patients already had joint infection at start of the study
One-day antibiotic infusion for the prevention of postoperative infection following arthroplasty: a case control study	Niimi,R.; Hasegawa,M.; Kawamura,G.; Sudo,A.	2011	ISRN.Orthop.	comparison not relevant to pico question. preop antibiotics are compared to pre + post op antibiotics.
Clinical outcome and microbiological findings using antibiotic-loaded spacers in two-stage revision of prosthetic joint infections	Cabo,J.; Euba,G.; Saborido,A.; Gonzalez-Panisello,M.; Dominguez,M.A.; Agullo,J.L.; Murillo,O.; Verdaguer,R.; Ariza,J.	2011	J.Infect.	not relevant. patients already had joint infection at start of the study
Prolonged duration of operation: an indicator of complicated surgery or of surgical (mis)management?	Gastmeier,P.; Sohr,D.; Breier,A.; Behnke,M.; Geffers,C.	2011	Infection	no relevant outcomes and not specific to hip and knee arthroplasty
2010 Mid-America Orthopaedic Association Physician in Training Award: predictors of early adverse outcomes after knee and hip arthroplasty in geriatric patients	Higuera,C.A.; Elsharkawy,K.; Klika,A.K.; Brocone,M.; Barsoum,W.K.	2011	Clin.Orthop.Relat.Res.	local complications outcome not specific to pji
Poor performance of microbiological sampling in the prediction of recurrent arthroplasty infection	Schindler,M.; Christofilopoulos,P.; Wyssa,B.; Belaieff,W.; Garzoni,C.; Bernard,L.; Lew,D.;	2011	Int.Orthop.	Not relevant to criteria-PATIENT POP

	Hoffmeyer,P.; Uckay,I.			
Preoperative diagnosis of periprosthetic joint infection: role of aspiration	Squire,M.W.; Della Valle,C.J.; Parvizi,J.	2011	AJR.Am.J.Roentgenol.	Commentary review
Intraoperative molds to create an articulating spacer for the infected knee arthroplasty	Van Thiel,G.S.; Berend,K.R.; Klein,G.R.; Gordon,A.C.; Lombardi,A.V.; Della Valle,C.J.	2011	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study
What is the role of serological testing between stages of two-stage reconstruction of the infected prosthetic knee?	Kusuma,S.K.; Ward,J.; Jacofsky,M.; Sporer,S.M.; Della Valle,C.J.	2011	Clin.Orthop.Relat.Res.	evaluates test in cohort where implant had already been removed.
Durable infection control and function with the PROSTALAC spacer in two-stage revision for infected knee arthroplasty	Gooding,C.R.; Masri,B.A.; Duncan,C.P.; Greidanus,N.V.; Garbuz,D.S.	2011	Clin.Orthop.Relat.Res.	was a study of treatment of PJI's, instead of PJI prevention
Cost-effectiveness of a Staphylococcus aureus screening and decolonization program for high-risk orthopedic patients	Slover,J.; Haas,J.P.; Quirno,M.; Phillips,M.S.; Bosco,J.A.,III	2011	J.Arthroplasty	cost effectiveness study
Diagnosis and management of infected total knee arthroplasty	Kalore,N.V.; Gioe,T.J.; Singh,J.A.	2011	Open Orthop.J.	narrative review
Antibiotic-impregnated cement spacer versus antibiotic irrigating metal spacer for infection management after THA	Fei,J.; Liu,G.D.; Yu,H.J.; Zhou,Y.G.; Wang,Y.	2011	Orthopedics	not relevant. patients already had joint infection at start of the study
Randomised clinical trial comparing Hydrofiber and alginate dressings post-hip replacement	Ravnskog,F.A.; Espehaug,B.; Indrekvam,K.	2011	J.Wound Care	Not relevant to criteria
Antibiotic-loaded acrylic bone cement in the revision of septic arthroplasty: where's the evidence?	Patti,B.N.; Lindeque,B.G.	2011	Orthopedics	systematic review
Unexpectedly increased rate of surgical site infections following implant surgery for hip fractures: problem solution with the bundle approach	Acklin,Y.P.; Widmer,A.F.; Renner,R.M.; Frei,R.; Gross,T.	2011	Injury	infection outcome not specific to pji; also patient population includes non-arthroplasty patients
Infection in total hip replacement: meta-analysis	Senthi,S.; Munro,J.T.; Pitto,R.P.	2011	Int.Orthop.	Meta analysis
Correlation between nutritional status and Staphylococcus colonization in hip and	Schwarzkopf,R.; Russell,T.A.; Shea,M.; Slover,J.D.	2011	Bull.NYU Hosp.Jt.Dis.	infection outcome not specific to pji

knee replacement patients				
Blood, bugs, and motion - what do we really know in regard to total joint arthroplasty?	Glassner,P.J.; Slover,J.D.; Bosco,J.A.,III; Zuckerman,J.D.	2011	Bull.NYU Hosp.Jt.Dis.	review
The Mark Coventry Award: diagnosis of early postoperative TKA infection using synovial fluid analysis	Bedair,H.; Ting,N.; Jacovides,C.; Saxena,A.; Moric,M.; Parvizi,J.; Della Valle,C.J.	2011	Clin.Orthop.Relat.Res.	Not relevant to criteria
Prophylactic oral antibiotics reduce reinfection rates following two-stage revision total knee arthroplasty	Zywiel,M.G.; Johnson,A.J.; Stroh,D.A.; Martin,J.; Marker,D.R.; Mont,M.A.	2011	Int.Orthop.	not relevant. patients already had joint infection at start of the study
Return to theatre following total hip and knee replacement, before and after the introduction of rivaroxaban: a retrospective cohort study	Jensen,C.D.; Steval,A.; Partington,P.F.; Reed,M.R.; Muller,S.D.	2011	J.Bone Joint Surg.Br.	does not answer pico question because both groups got vte prophylaxis
Birmingham hip resurfacing: a minimum follow-up of ten years	Treacy,R.B.; McBryde,C.W.; Shears,E.; Pynsent,P.B.	2011	J.Bone Joint Surg.Br.	Not relevant to criteria
Does the postoperative dressing regime affect wound healing after hip or knee arthroplasty?	Collins,A.	2011	J.Wound Care	Systematic review
Effects of periarticular steroid injection on knee function and the inflammatory response following Unicondylar Knee Arthroplasty	Ng,Y.C.; Lo,N.N.; Yang,K.Y.; Chia,S.L.; Chong,H.C.; Yeo,S.J.	2011	Knee Surg.Sports Traumatol.Arthrosc.	patients didn't get tja
Single-dose periarticular steroid infiltration for pain management in total knee arthroplasty: a prospective, double-blind, randomised controlled trial	Sean,V.W.; Chin,P.L.; Chia,S.L.; Yang,K.Y.; Lo,N.N.; Yeo,S.J.	2011	Singapore Med.J.	unclear if infection outcome is specific to pji.
Morbid obesity and excessive hospital resource consumption for unilateral primary hip and knee arthroplasty	Kim,S.H.	2010	J.Arthroplasty	cost analysis
Incidence and risk factors for deep surgical site infection after primary total hip arthroplasty: a systematic review	Urquhart,D.M.; Hanna,F.S.; Brennan,S.L.; Wluka,A.E.; Leder,K.; Cameron,P.A.; Graves,S.E.; Cicuttini,F.M.	2010	J.Arthroplasty	systematic review

Is obesity a contraindication for minimal invasive total knee replacement? A prospective randomized control trial	Chalidis,B.E.; Petsatodis,G.; Christodoulou,A.G.; Christoforidis,J.; Papadopoulos,P.P.; Pournaras,J.	2010	Obes.Surg.	does not evaluate if obesity is risk factor for pji
Arthroplasty following a septic arthritis history: a 53 cases series	Bauer,T.; Lacoste,S.; Lhotellier,L.; Mamoudy,P.; Lortat-Jacob,A.; Hardy,P.	2010	Orthop.Traumatol.Surg.Res.	less than 25 patients per group and wouldn't asnwer the pico question because previous infection patients are compared to current infection patients, and not compared to patients undergoing tja without infection
Total knee arthroplasty in younger patients: a 13-year follow-up study	Bisschop,R.; Brouwer,R.W.; van Raay,J.J.	2010	Orthopedics	evaluates risk factors for all revisions, and not specific to revision due to infection
Geriatric hip fracture clinical pathway: the Hong Kong experience	Lau,T.W.; Leung,F.; Siu,D.; Wong,G.; Luk,K.D.	2010	Osteoporos.Int.	Not relevant to criteria
Is there adequate provision of venous thromboembolism prophylaxis following hip arthroplasty? An audit and international survey	Rogers,B.A.; Phillips,S.; Foote,J.; Drabu,K.J.	2010	Ann.R Coll.Surg.Engl.	both groups got vte prophylaxis, so study does not answer pico question
Rates of infection and revision in patients with renal disease undergoing total knee replacement in Scotland	McCleery,M.A.; Leach,W.J.; Norwood,T.	2010	J.Bone Joint Surg.Br.	unclear if infection outcome is specific to PJI
Dermabond efficacy in total joint arthroplasty wounds	Miller,A.G.; Swank,M.L.	2010	Am.J.Orthop.(Belle.Mead.NJ.)	Not relevant to criteria
Incidence of deep infection in aseptic revision THA using vancomycin-impregnated impacted bone allograft	Buttaro,M.A.; Guala,A.J.; Comba,F.; Suarez,F.; Piccaluga,F.	2010	Hip Int.	not an a study of antibiotic cement
Antibiotic-coated spacers for total hip arthroplasty infection	Bloomfield,M.R.; Klika,A.K.; Barsoum,W.K.	2010	Orthopedics	review of infection treatment
Total knee replacement in the morbidly obese: a literature review	Samson,A.J.; Mercer,G.E.; Campbell,D.G.	2010	ANZ J.Surg.	systematic review
Factors that predict short-term complication rates after total hip arthroplasty	SooHoo,N.F.; Farng,E.; Lieberman,J.R.; Chambers,L.; Zingmond,D.S.	2010	Clin.Orthop.Relat.Res.	unclear if infection outcome is specific to PJI
Perioperative testing for persistent sepsis following resection arthroplasty of the hip for periprosthetic infection	Shukla,S.K.; Ward,J.P.; Jacofsky,M.C.; Sporer,S.M.; Paprosky,W.G.; Della Valle,C.J.	2010	J.Arthroplasty	evaluates tests in a cohort in which infected implant had already been removed

Two-stage exchange knee arthroplasty: does resistance of the infecting organism influence the outcome?	Kurd,M.F.; Ghanem,E.; Steinbrecher,J.; Parvizi,J.	2010	Clin.Orthop.Relat.Res.	was a study of PJI treatment, instead of prevention
Subcutaneous versus intraarticular indwelling closed suction drainage after TKA: a randomized controlled trial	Seo,E.S.; Yoon,S.W.; Koh,I.J.; Chang,C.B.; Kim,T.K.	2010	Clin.Orthop.Relat.Res.	Not relevant to criteria
Detection of low-grade prosthetic joint infections using 99mTc-antigranulocyte SPECT/CT: initial clinical results	Graute,V.; Feist,M.; Lehner,S.; Haug,A.; Muller,P.E.; Bartenstein,P.; Hacker,M.	2010	Eur.J.Nucl.Med.Mol.Imaging	Not relevant to criteria for participant-shoulder included
Factors affecting the incidence of infection in hip and knee replacement: an analysis of 5277 cases	Willis-Owen,C.A.; Konyves,A.; Martin,D.K.	2010	J.Bone Joint Surg.Br.	infection outcome not specific to pji
Risk factors for treatment failure in patients with prosthetic joint infections	Lee,J.; Kang,C.I.; Lee,J.H.; Joung,M.; Moon,S.; Wi,Y.M.; Chung,D.R.; Ha,C.W.; Song,J.H.; Peck,K.R.	2010	J.Hosp.Infect.	not all patients got arthroplasty
Prevention of infection after knee arthroplasty	Gorenoi,V.; Schonermark,M.P.; Hagen,A.	2010	GMS.Health Technol.Assess.	Systematic review
Results after late polymicrobial, gram-negative, and methicillin-resistant infections in knee arthroplasty	Cordero-Ampuero,J.; Esteban,J.; Garcia-Rey,E.	2010	Clin.Orthop.Relat.Res.	not relevant to pico question
The risk of revision after primary total hip arthroplasty among statin users: a nationwide population-based nested case-control study	Thillemann,T.M.; Pedersen,A.B.; Mehnert,F.; Johnsen,S.P.; Soballe,K.	2010	J.Bone Joint Surg.Am.	doesn't answer pico question. The variable of interest in this study is statin use, which the authors note that the indication for prescription was for cardiac disease and those at risk for cardiac disease. therefore, since those without cardiac disease are included in the statin group, this study cannot answer the pico question of whether cardiac disease increases risk of infectionl
Laboratory and clinical characteristics of Staphylococcus lugdunensis prosthetic joint infections	Shah,N.B.; Osmon,D.R.; Fadel,H.; Patel,R.; Kohner,P.C.; Steckelberg,J.M.; Mabry,T.; Berbari,E.F.	2010	J.Clin.Microbiol.	not relevant. evaluates pji treatment with antibiotics, instead of prevention
Postoperative deep infection in tumor endoprosthesis reconstruction around the knee	Morii,T.; Yabe,H.; Morioka,H.; Beppu,Y.; Chuman,H.; Kawai,A.; Takeda,K.; Kikuta,K.; Hosaka,S.;	2010	J.Orthop.Sci.	not specific to arthroplast patients

	Yazawa,Y.; Takeuchi,K.; Anazawa,U.; Mochizuki,K.; Satomi,K.			
Empirical antibiotic therapy in prosthetic joint infections	Sousa,R.; Pereira,A.; Massada,M.; da Silva,M.V.; Lemos,R.; Costa e Castro	2010	Acta Orthop.Belg.	not relevant. studied treatment for pji, instead of pji prophylaxis
Molecular fingerprinting of Staphylococcus aureus from bone and joint infections	Luedicke,C.; Slickers,P.; Ehricht,R.; Monecke,S.	2010	Eur.J.Clin.Microbiol.Infect.Dis.	not relevant to screening, since swab were tested form patients who already had infectoin
The microbiology of the infected knee arthroplasty	Nickinson,R.S.; Board,T.N.; Gambhir,A.K.; Porter,M.L.; Kay,P.R.	2010	Int.Orthop.	not relevant. patients already had joint infection at start of the study
Detection of periprosthetic infections with use of ribosomal RNA-based polymerase chain reaction	Bergin,P.F.; Doppelt,J.D.; Hamilton,W.G.; Mirick,G.E.; Jones,A.E.; Sritulanondha,S.; Helm,J.M.; Tuan,R.S.	2010	J.Bone Joint Surg.Am.	Not relevant to criteria
Prophylactic use of antibiotic-loaded bone cement in primary total knee replacement	Randelli,P.; Evola,F.R.; Cabitza,P.; Polli,L.; Denti,M.; Vaienti,L.	2010	Knee Surg.Sports Traumatol.Arthrosc.	narrative review
Allogeneic blood transfusion does not increase the risk of wound infection in total knee arthroplasty	Basora,M.; Pereira,A.; Soriano,A.; Martinez-Pastor,J.C.; Sanchez-Etayo,G.; Tio,M.; Salazar,F.	2010	Vox Sang.	infection outcome not specific to pji
Staphylococcus aureus Decolonization Protocol Decreases Surgical Site Infections for Total Joint Replacement	Hadley,S.; Immerman,I.; Hutzler,L.; Slover,J.; Bosco,J.	2010	Arthritis	confounding treatments given, so independent effect of each treatment cannot be evaluated
Dental procedures as risk factors for prosthetic hip or knee infection: a hospital-based prospective case-control study	Berbari,E.F.; Osmon,D.R.; Carr,A.; Hanssen,A.D.; Baddour,L.M.; Greene,D.; Kupp,L.I.; Baughan,L.W.; Harmsen,W.S.; Mandrekar,J.N.; Therneau,T.M.; Steckelberg,J.M.; Virk,A.; Wilson,W.R.	2010	Clin.Infect.Dis.	
Survival of bicompartmental knee arthroplasty at 5 to 23 years	Parratte,S.; Pauly,V.; Aubaniac,J.M.; Argenson,J.N.	2010	Clin.Orthop.Relat.Res.	not relevant. does not evaluate risk factors for pji

Two-stage revision of hip prosthesis infection using a hip spacer with stabilising proximal cementation	Gil,Gonzalez S.; Marques,Lopez F.; Rigol,Ramon P.; Mestre,Cortadellas C.; Caceres,Palou E.; Leon,Garcia A.	2010	Hip Int.	not relevant. patients already had joint infection at start of the study
Age as a risk factor of nosocomial infection after hip fracture surgery	Cruz,E.; Cano,J.R.; Benitez-Parejo,N.; Rivas-Ruiz,F.; Perea-Milla,E.; Guerado,E.	2010	Hip Int.	not specific to arthrplasty population and infection outcome not specific to pji
Long-stem versus short-stem preformed antibiotic-loaded cement spacers for two-stage revision of infected total hip arthroplasty	Romano,C.L.; Romano,D.; Logoluso,N.; Meani,E.	2010	Hip Int.	not relevant. patients already had joint infection at start of the study
Decolonization of drug-resistant organisms before total joint arthroplasty	Parvizi,J.; Matar,W.Y.; Saleh,K.J.; Schmalzried,T.P.; Mihalko,W.M.	2010	Instr.Course Lect.	narrative review
Oucome of management of non-gonococcal septic arethritis at National Orthopaedic Hospital, Enugu, Nigeria	Eyichukwu,G.O.; Onyemaechi,N.O.; Onyegbule,E.C.	2010	Niger.J.Med.	not specific to hip and knee. also unclear if septic arthritis was caused by prosthetic joint
Allogeneic blood transfusion and prognosis following total hip replacement: a population-based follow up study	Pedersen,A.B.; Mehnert,F.; Overgaard,S.; Johnsen,S.P.	2009	BMC Musculoskelet.Disord.	unclear if transfusions were given preoperatively for anemia, so unclear if article is relevant to pico question
Inadequate timing of prophylactic antibiotics in orthopedic surgery. We can do better	Stefansdottir,A.; Robertsson,O.; Dahl,A.; Kiernan,S.; Gustafson,P.; Lidgren,L.	2009	Acta Orthop.	no relevant outcomes for pico question
Combined preoperative autologous blood donation and intra-operative cell salvage for hip surgery	Kubota,R.; Nozawa,M.; Matsuda,K.; Maezawa,K.; Kim,S.G.; Maeda,K.; Ikegami,T.; Hayashi,K.; Nagayama,M.; Kaneko,H.	2009	J.Orthop.Surg.(Hong Kong)	does not evaluate risk factors for pji. also infection outcome not specific to pji
Continuous intra-articular infusion of ropivacaine after unilateral total knee arthroplasty	Reeves,M.; Skinner,M.W.	2009	Anaesth.Intensive Care	not relevant
Effect of dressing choice on outcomes after hip and knee arthroplasty: a literature review	Tustanowski,J.	2009	J.Wound Care	Literary review

Treatment of infected total hip arthroplasty with a 2-stage reimplantation protocol: update on "our institution's" experience from 1989 to 2003	Toulson,C.; Walcott-Sapp,S.; Hur,J.; Salvati,E.; Bostrom,M.; Brause,B.; Westrich,G.H.	2009	J.Arthroplasty	not relevant. patients already had joint infection at start of the study
Prophylactic antibiotics in hip and knee arthroplasty	Meehan,J.; Jamali,A.A.; Nguyen,H.	2009	J.Bone Joint Surg.Am.	lit review
Complications after spacer implantation in the treatment of hip joint infections	Jung,J.; Schmid,N.V.; Kelm,J.; Schmitt,E.; Anagnostakos,K.	2009	Int.J.Med.Sci.	not relevant. patients already had joint infection at start of the study
Vacuum-assisted closure in the treatment of early hip joint infections	Kelm,J.; Schmitt,E.; Anagnostakos,K.	2009	Int.J.Med.Sci.	Patient population
Oral antibiotics are effective for highly resistant hip arthroplasty infections	Cordero-Ampuero,J.; Esteban,J.; Garcia-Cimbrelo,E.	2009	Clin.Orthop.Relat.Res.	was a study of PJI treatment, instead of prevention
Two-stage revision of infected hip arthroplasty using an antibiotic-loaded spacer: retrospective comparison between short-term and prolonged antibiotic therapy	Hsieh,P.H.; Huang,K.C.; Lee,P.C.; Lee,M.S.	2009	J.Antimicrob.Chemother.	not a study of uninfected joint replacement
Efficacy of intra-articular cocktail analgesic injection in total knee arthroplasty - a randomized controlled trial	Fu,P.; Wu,Y.; Wu,H.; Li,X.; Qian,Q.; Zhu,Y.	2009	Knee	confounded treatment study. steroid plus 2 other treatments given to study group, whereas control group only gets saline. unable to separate effects of the steroid
Timing of antimicrobial prophylaxis and the risk of surgical site infections: results from the Trial to Reduce Antimicrobial Prophylaxis Errors	Steinberg,J.P.; Braun,B.I.; Hellinger,W.C.; Kusek,L.; Bozikis,M.R.; Bush,A.J.; Dellinger,E.P.; Burke,J.P.; Simmons,B.; Kritchevsky,S.B.	2009	Ann.Surg.	not specific to hip and knee arthroplasty
Relationship between perioperative urinary tract infection and deep infection after joint arthroplasty	Koulouvaris,P.; Sculco,P.; Finerty,E.; Sculco,T.; Sharrock,N.E.	2009	Clin.Orthop.Relat.Res.	less than 25 patients had UTI
The impact of glycemic control and diabetes mellitus on perioperative outcomes after total joint arthroplasty	Marchant,M.H.,Jr.; Viens,N.A.; Cook,C.; Vail,T.P.; Bolognesi,M.P.	2009	J.Bone Joint Surg.Am.	unclear if infection outcome is specific to pji.
A 5 to 8 year follow-up study of the Rotaglide mobile bearing total knee arthroplasty	Hudd,A.; Kunasingam,K.; Ricketts,D.; Bush,J.	2009	Int.Orthop.	Not relevant to criteria

Total hip arthroplasty for osteoarthritis in patients aged 80 years or older: influence of co-morbidities on final outcome	De,Thomasson E.; Caux,I.; Guingand,O.; Terracher,R.; Mazel,C.	2009	Orthop.Traumatol.Surg.Res.	for obesity, the cutoff was bmi of 25, which means some non-obese patients were in the higher bmi group. for relevant comorbidities, less than 25 patients had comorbidities that were relevant to pico question
Efficacy of teicoplanin for the prevention of surgical site infections after total hip or knee arthroplasty: a prospective, open-label study	Kanellakopoulou,K.; Papadopoulos,A.; Varvaroussis,D.; Varvaroussis,A.; Giamarellos-Bourboulis,E.J.; Pagonas,A.; Stergiou,A.; Papadelis,P.; Nikolaidis,V.; Giamarellou,H.	2009	Int.J.Antimicrob.Agents	insufficient data to compar teicoplanin to spicific antibiotics in the control group, since comparator group had several different antibiotics chosen by their surgeons.
The risk related to surgical site infections after hip endoarthroplasty--surveillance outcome analysis in two Polish orthopaedic centres	Wojkowska-Mach,J.; Bulanda,M.; Jaje,E.; Romaniszyn,D.; Ziolkowski,G.; Franczuk,B.; Gazdzik,T.; Kochan,P.; Heczko,P.B.	2009	Ortop.Traumatol.Rehabil.	for risk factor analysis, infection outcome not specific to pji
Elution of gentamicin and vancomycin from polymethylmethacrylate beads and hip spacers in vivo	Anagnostakos,K.; Wilmes,P.; Schmitt,E.; Kelm,J.	2009	Acta Orthop.	not relevant. patients already had joint infection at start of the study
Circulating cytokines after hip and knee arthroplasty: a preliminary study	Shah,K.; Mohammed,A.; Patil,S.; McFadyen,A.; Meek,R.M.	2009	Clin.Orthop.Relat.Res.	not a diagnostic study
Two-stage reimplantation of infected hip arthroplasties	Chen,W.S.; Fu,T.H.; Wang,J.W.	2009	Chang Gung Med.J.	not a diagnostic study
Liquid gentamicin in bone cement spacers: in vivo antibiotic release and systemic safety in two-stage revision of infected hip arthroplasty	Hsieh,P.H.; Huang,K.C.; Tai,C.L.	2009	J.Trauma	not relevant. patients already had joint infection at start of the study
FDG-PET in patients with painful hip and knee arthroplasty: technical breakthrough or just more of the same	Reinartz,P.	2009	Q.J.Nucl.Med.Mol.Imaging	Commentary review
Midterm to long-term followup of staged reimplantation for infected hip arthroplasty	Sanchez-Sotelo,J.; Berry,D.J.; Hanssen,A.D.; Cabanela,M.E.	2009	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study
Surgical treatment of early wound complications following primary total knee arthroplasty	Galat,D.D.; McGovern,S.C.; Larson,D.R.; Harrington,J.R.; Hanssen,A.D.; Clarke,H.D.	2009	J.Bone Joint Surg.Am.	wound healing complications is used as a risk factor, but it cannot be used for the previous infection PICO question because the wound

				healing complications are not specific to infection.
Risk factors for infection after knee arthroplasty. A register-based analysis of 43,149 cases	Jamsen,E.; Huhtala,H.; Puolakka,T.; Moilanen,T.	2009	J.Bone Joint Surg.Am.	Not relevant to criteria
Is prolonged systemic antibiotic treatment essential in two-stage revision hip replacement for chronic Gram-positive infection?	Whittaker,J.P.; Warren,R.E.; Jones,R.S.; Gregson,P.A.	2009	J.Bone Joint Surg.Br.	not relevant. studied pji treatment, and not prevention. also was a case-series with confounded treatments, since group was treated with both antibiotic spacer and systemic anti biotics.
10-year evaluation of the cementless low-contact- stress rotating-platform total knee arthroplasty	Efstathopoulos,N.; Mavrogenis,A.F.; Lallos,S.; Nikolaou,V.; Papagelopoulos,P.J.; Savvidou,O.D.; Korres,D.S.	2009	J.Long Term Eff.Med.Implants	does not look at risk factors for infection
Microbiology of infected arthroplasty: implications for empiric peri-operative antibiotics	Sharma,D.; Douglas,J.; Coulter,C.; Weinrauch,P.; Crawford,R.	2008	J.Orthop.Surg.(Hong Kong)	not a diagnostic study
Two-stage revision of infected total knee arthroplasty using an antibiotic-impregnated static cement-spacer	Hsu,C.S.; Hsu,C.C.; Wang,J.W.; Lin,P.C.	2008	Chang Gung Med.J.	not relevant. patients already had joint infection at start of the study
Antigranulocyte scintigraphy in infected hip prosthesis: the diagnostic importance of delayed 20-24-h imaging and semiquantitative analysis	Rubello,D.; Rampin,L.; Banti,E.; Grassetto,G.; Massaro,A.; Cittadin,S.; Pavan,L.; Cattelan,A.M.; Fanti,S.; Al-Nahhas,A.; Gross,M.D.; Alavi,A.	2008	Nucl.Med.Commun.	Very low quality
The utility of the perioperative autologous transfusion system OrthoPAT in total hip replacement surgery: a prospective study	del Trujillo,M.M.; Carrero,A.; Munoz,M.	2008	Arch.Orthop.Trauma Surg.	does not answer pico question of whether active thromboprophylaxis is a risk factor for pji
Treatment of stage III-A-1 and III-B-1 periprosthetic knee infection with two-stage exchange arthroplasty and articulating spacer	Babis,G.C.; Zahos,K.A.; Tsailas,P.; Karaliotas,G.I.; Kanellakopoulou,K.; Soucacos,P.N.	2008	J.Surg.Orthop.Adv.	not relevant. patients already had joint infection at start of the study
Two-year outcomes in primary THA in obese male veterans administration medical center patients	Grant,J.A.; Viens,N.; Bolognesi,M.P.; Olson,S.A.; Cook,C.E.	2008	Rheumatol.Int.	infection outcome not specific to pji

Antibiotic prophylaxis for wound infections in total joint arthroplasty: a systematic review	AlBuhairan,B.; Hind,D.; Hutchinson,A.	2008	J.Bone Joint Surg.Br.	systematic review
Efficacy of antibiotic-impregnated cement in total hip replacement	Parvizi,J.; Saleh,K.J.; Ragland,P.S.; Pour,A.E.; Mont,M.A.	2008	Acta Orthop.	meta-analysis
The value of C-reactive protein for postoperative monitoring of lower limb arthroplasty	Dupont,C.; Rodenbach,J.; Flachaire,E.	2008	Ann.Readapt.Med.Phys.	Not relevant to criteria
Early infection after hip fracture surgery: risk factors, costs and outcome	Edwards,C.; Counsell,A.; Boulton,C.; Moran,C.G.	2008	J.Bone Joint Surg.Br.	not all patients got arthroplasty
Peri-articular steroid injection improves the outcome after unicondylar knee replacement: a prospective, randomised controlled trial with a two-year follow-up	Pang,H.N.; Lo,N.N.; Yang,K.Y.; Chong,H.C.; Yeo,S.J.	2008	J.Bone Joint Surg.Br.	patients did not get total joint replacement
Risk factors in total joint arthroplasty: comparison of infection rates in patients with different socioeconomic backgrounds	Webb,B.G.; Lichtman,D.M.; Wagner,R.A.	2008	Orthopedics	abstract only
Treatment of joint prosthesis infection in accordance with current recommendations improves outcome	Betsch,B.Y.; Eggli,S.; Siebenrock,K.A.; Tauber,M.G.; Muhlemann,K.	2008	Clin.Infect.Dis.	not relevant. patients already had joint infection at start of the study
Diagnosis of infected total knee arthroplasty with anti-granulocyte scintigraphy: the importance of a dual-time acquisition protocol	Rubello,D.; Rampin,L.; Banti,E.; Massaro,A.; Cittadin,S.; Cattelan,A.M.; Al-Nahhas,A.	2008	Nucl.Med.Commun.	Very low quality
Incorporation of large amounts of gentamicin sulphate into acrylic bone cement: effect on handling and mechanical properties, antibiotic release, and biofilm formation	Dunne,N.J.; Hill,J.; McAfee,P.; Kirkpatrick,R.; Patrick,S.; Tunney,M.	2008	Proc.Inst.Mech.Eng.H	in vitro
Long-term outcome of total knee replacement in patients with rheumatoid arthritis	Trieb,K.; Schmid,M.; Stulnig,T.; Huber,W.; Wanivenhaus,A.	2008	Joint Bone Spine	does not look at risk factors for infection
Infection in primary total knee replacement	Fan,J.C.; Hung,H.H.; Fung,K.Y.	2008	Hong Kong Med.J.	infection outcome not specific to pji

The use of two-stage exchange arthroplasty with depot antibiotics in the absence of long-term antibiotic therapy in infected total hip replacement	Stockley,I.; Mockford,B.J.; Hoad-Reddick,A.; Norman,P.	2008	J.Bone Joint Surg.Br.	not relevant. patients already had joint infection at start of the study
Application of Hazard Analysis Critical Control Points to control surgical site infections in hip and knee arthroplasty	Quattrin,R.; Brusaferro,S.; Turello,D.; Faruzzo,A.; Calligaris,L.; Causero,A.	2008	Orthopedics	Not relevant to criteria
A systematic review and economic model of switching from non-glycopeptide to glycopeptide antibiotic prophylaxis for surgery	Cranny,G.; Elliott,R.; Weatherly,H.; Chambers,D.; Hawkins,N.; Myers,L.; Sculpher,M.; Eastwood,A.	2008	Health Technol.Assess.	systematic review and economic study.
Accuracy of intraoperative cultures in primary total hip arthroplasty	Picado,C.H.; Garcia,F.L.; Chagas,M.V.,Jr.; Toquetao,F.G.	2008	Hip Int.	Not relevant to criteria
Total hip replacement in renal transplant patients	Nowicki,P.; Chaudhary,H.	2007	J.Bone Joint Surg.Br.	review
Antibiotic-loaded cement articulating spacer for 2-stage reimplantation in infected total knee arthroplasty: a simple and economic method	Hsu,Y.C.; Cheng,H.C.; Ng,T.P.; Chiu,K.Y.	2007	J.Arthroplasty	not relevant. patients already had joint infection at start of the study
Ultraviolet lighting during orthopaedic surgery and the rate of infection	Ritter,M.A.; Olberding,E.M.; Malinzak,R.A.	2007	J.Bone Joint Surg.Am.	Not relevant to criteria
Low relapse with oral antibiotics and two-stage exchange for late arthroplasty infections in 40 patients after 2-9 years	Cordero-Ampuero,J.; Esteban,J.; Garcia-Cimbrelo,E.; Munuera,L.; Escobar,R.	2007	Acta Orthop.	not relevant test to pico question
Surgical debridement and parenteral antibiotics in infected revision total knee arthroplasty	Chiu,F.Y.; Chen,C.M.	2007	Clin.Orthop.Relat.Res.	patients didn't get arthroplasty
Delayed onset of deep infection after total knee arthroplasty: comparison based on the infecting organism	Joshy,S.; Gogi,N.; Thomas,B.; Mahale,A.; Singh,B.K.	2007	J.Orthop.Surg.(Hong Kong)	not relevant to screening and decolonization since patients already had infection
Guiding empirical antibiotic therapy in orthopaedics: The microbiology of prosthetic joint infection managed by debridement, irrigation and prosthesis retention	Moran,E.; Masters,S.; Berendt,A.R.; McLardy-Smith,P.; Byren,I.; Atkins,B.L.	2007	J.Infect.	no relevant outcomes and was a study of treatment
Does this adult patient have septic arthritis?	Margaretten,M.E.; Kohlwes,J.; Moore,D.; Bent,S.	2007	JAMA	Systematic review

Prospective study of the treatment of infected hip arthroplasties with or without the use of an antibiotic-loaded cement spacer	Cabrita,H.B.; Croci,A.T.; Camargo,O.P.; Lima,A.L.	2007	Clinics (Sao Paulo)	not relevant. patients already had joint infection at start of the study
Autotransfusion drains in total knee replacement. Are they alternatives to homologous transfusion?	Abuzakuk,T.; Senthil,Kumar,V; Shenava,Y.; Bulstrode,C.; Skinner,J.A.; Cannon,S.R.; Briggs,T.W.	2007	Int.Orthop.	Not relevant to criteria
Antibiotic-impregnated cement spacers for the treatment of infection associated with total hip or knee arthroplasty	Cui,Q.; Mihalko,W.M.; Shields,J.S.; Ries,M.; Saleh,K.J.	2007	J.Bone Joint Surg.Am.	not relevant. patients already had joint infection at start of the study
Perioperative risk of hip arthroplasty in patients with cirrhotic liver disease	Moon,Y.W.; Kim,Y.S.; Kwon,S.Y.; Kim,S.Y.; Lim,S.J.; Park,Y.S.	2007	J.Korean Med.Sci.	outcome not specific to PJI
Deep infection after total knee replacement: impact of laminar airflow systems and body exhaust suits in the modern operating room	Miner,A.L.; Losina,E.; Katz,J.N.; Fossel,A.H.; Platt,R.	2007	Infect.Control Hosp.Epidemiol.	hospital was unit of analysis, rather than the patient. it therefore cant answer pico question
Total knee replacement in haemophilic arthropathy	Rodriguez-Merchan,E.C.	2007	J.Bone Joint Surg.Br.	less than 25 patients had HIV
Total hip replacement after intra-articular injection of local anaesthetic and steroid	Chitre,A.R.; Fehily,M.J.; Bamford,D.J.	2007	J.Bone Joint Surg.Br.	retrospective case series
Risk factors and clinical impact of postoperative symptomatic venous thromboembolism	Gangireddy,C.; Rectenwald,J.R.; Upchurch,G.R.; Wakefield,T.W.; Khuri,S.; Henderson,W.G.; Henke,P.K.	2007	J.Vasc.Surg.	does not evaluate risk factors for PJI
Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies (Vol. 6: Prevention of Healthcare-Associated Infections).	Ranji,S.R.; Shetty,K.; Posley,K.A.; Lewis,R.; Sundaram,V.; Galvin,C.M.; Winston,L.G.	2007	AHRQ Technical Reviews	systematic review
21-year results of the uncemented fully textured lord hip prosthesis	Martinez de Aragon,J.S.; Keisu,K.S.	2007	Clin.Orthop.Relat.Res.	Not relevant to criteria
The safety of hip injection with corticosteroid in the diagnosis and treatment of osteoarthritis	Karuppiah,S.V.; Gibson,P.	2007	Hip Int.	retrospective case series

Cementless two-stage exchange arthroplasty for infection after total hip arthroplasty	Masri,B.A.; Panagiotopoulos,K.P.; Greidanus,N.V.; Garbuz,D.S.; Duncan,C.P.	2007	J.Arthroplasty	patient spectrum not representative of population defined in pico question
Factors associated with prolonged wound drainage after primary total hip and knee arthroplasty	Patel,V.P.; Walsh,M.; Sehgal,B.; Preston,C.; DeWal,H.; Di Cesare,P.E.	2007	J.Bone Joint Surg.Am.	Not relevant to criteria
Prosthesis infection: diagnosis after total joint arthroplasty with antigranulocyte scintigraphy with 99mTc-labeled monoclonal antibodies--a meta-analysis	Pakos,E.E.; Trikalinos,T.A.; Fotopoulos,A.D.; Ioannidis,J.P.	2007	Radiology	Meta analysis
Incidence and risk factors for surgical infection after total knee replacement	Babkin,Y.; Raveh,D.; Lifschitz,M.; Itzchaki,M.; Wiener-Well,Y.; Kopuit,P.; Jerassy,Z.; Yinnon,A.M.	2007	Scand.J.Infect.Dis.	infection outcome not specific to pji
Surgical outcomes in human immunodeficiency virus-infected patients in the era of highly active antiretroviral therapy	Horberg,M.A.; Hurley,L.B.; Klein,D.B.; Follansbee,S.E.; Quesenberry,C.; Flamm,J.A.; Green,G.M.; Luu,T.	2006	Arch.Surg.	not specific to hip or knee arthroplasty
Usefulness of hybrid SPECT/CT in 99mTc-HMPAO-labeled leukocyte scintigraphy for bone and joint infections	Filippi,L.; Schillaci,O.	2006	J.Nucl.Med.	Less than 25 in each group
Surgical site infection in the elderly following orthopaedic surgery. Risk factors and outcomes	Lee,J.; Singletary,R.; Schmader,K.; Anderson,D.J.; Bolognesi,M.; Kaye,K.S.	2006	J.Bone Joint Surg.Am.	not specific to arthroplasty patients
Two-stage revision of infected total knee replacements using articulating cement spacers and short-term antibiotic therapy	Hart,W.J.; Jones,R.S.	2006	J.Bone Joint Surg.Br.	not relevant. was a study of treatment for pji, instead of prevention of pji. also retrspective case series
High concentration and bioactivity of vancomycin and aztreonam eluted from Simplex cement spacers in two-stage revision of infected hip implants: a study of 46 patients at an average follow-up of 107 days	Hsieh,P.H.; Chang,Y.H.; Chen,S.H.; Ueng,S.W.; Shih,C.H.	2006	J.Orthop.Res.	not relevant. patients already had joint infection at start of the study
Effect of intra-articular steroids on deep infections following total knee arthroplasty	Joshy,S.; Thomas,B.; Gogi,N.; Modi,A.; Singh,B.K.	2006	Int.Orthop.	less than 25 patients had injections

Accuracy of joint aspiration for the preoperative diagnosis of infection in total hip arthroplasty	Ali,F.; Wilkinson,J.M.; Cooper,J.R.; Kerry,R.M.; Hamer,A.J.; Norman,P.; Stockley,I.	2006	J.Arthroplasty	the patient spectrum included in study is not representative of the full patients spectrum relevant to pico question. therefore, the study would provide inadequate quality evidence to answer pico question
Evaluation of measures to decrease intra-operative bacterial contamination in orthopaedic implant surgery	Knobben,B.A.; van Horn,J.R.; van der Mei,H.C.; Busscher,H.J.	2006	J.Hosp.Infect.	Very low quality
A prospective, randomised, controlled trial comparing wound dressings used in hip and knee surgery: Aquacel and Tegaderm versus Cutiplast	Ravenscroft,M.J.; Harker,J.; Buch,K.A.	2006	Ann.R Coll.Surg.Engl.	Not relevant to criteria
Urinary retention and the role of indwelling catheterization following total knee arthroplasty	Kumar,P.; Mannan,K.; Chowdhury,A.M.; Kong,K.C.; Pati,J.	2006	Int.Braz.J.Urol.	risk factors for pji not examined
Single-incision anterior approach for total hip arthroplasty on an orthopaedic table	Matta,J.M.; Shahrdar,C.; Ferguson,T.	2005	Clin.Orthop.Relat.Res.	does not look at risk factors for pji
Reducing the risk of deep wound infection in primary joint arthroplasty with antibiotic bone cement	Block,J.E.; Stubbs,H.A.	2005	Orthopedics	systematic review
Diagnostic value of routine drain tip culture in primary joint arthroplasty	Weinrauch,P.	2005	ANZ J.Surg.	Not relevant to criteria
Ten-year experience using an articulating antibiotic cement hip spacer for the treatment of chronically infected total hip	Hofmann,A.A.; Goldberg,T.D.; Tanner,A.M.; Cook,T.M.	2005	J.Arthroplasty	not relevant. patients already had joint infection at start of the study
Does body mass index affect the early outcome of primary total hip arthroplasty?	Moran,M.; Walmsley,P.; Gray,A.; Brenkel,I.J.	2005	J.Arthroplasty	risk factors only reported for superficial infection
Prognostic factors influencing the functional outcome of total hip arthroplasty for hip infection sequelae	Park,Y.S.; Moon,Y.W.; Lim,S.J.; Oh,I.; Lim,J.S.	2005	J.Arthroplasty	doesn't answer previous infection pico because all patients had infection at the start of the study
The role of MRSA screening in joint-replacement surgery	Sankar,B.; Hopgood,P.; Bell,K.M.	2005	Int.Orthop.	unclear if infection outcome is specific to PJI
Epidemiology of total knee replacement in the United States Medicare population	Mahomed,N.N.; Barrett,J.; Katz,J.N.; Baron,J.A.; Wright,J.; Losina,E.	2005	J.Bone Joint Surg.Am.	insufficient data presentation for the effect of age on deep infection.
Infection of the surgical site after arthroplasty of the hip	Ridgeway,S.; Wilson,J.; Charlet,A.; Kafatos,G.;	2005	J.Bone Joint Surg.Br.	outcome not specific to PJI

	Pearson,A.; Coello,R.			
Knee and hip arthroplasty infection rates in persons with haemophilia: a 27 year single center experience during the HIV epidemic	Powell,D.L.; Whitener,C.J.; Dye,C.E.; Ballard,J.O.; Shaffer,M.L.; Eyster,M.E.	2005	Haemophilia	less than 25 patients had HIV
Total hip arthroplasty in patients with human immunodeficiency virus infection: pathologic findings and surgical outcomes	Mahoney,C.R.; Glesby,M.J.; DiCarlo,E.F.; Peterson,M.G.; Bostrom,M.P.	2005	Acta Orthop.	only HIV patients were evaluated for post surgical outcomes, so they were not compared to the non-HIV group
Vancomycin-supplemented impacted bone allografts in infected hip arthroplasty. Two-stage revision results	Buttaro,M.A.; Pusso,R.; Piccaluga,F.	2005	J.Bone Joint Surg.Br.	retrospective case series
Intra-articular viscosupplementation with hylan g-f 20 to treat osteoarthritis of the knee: an evidence-based analysis		2005	Ont.Health Technol.Assess.Ser.	systematic review
The influence of preclinical anaemia on outcome following total hip replacement	Myers,E.; O'Grady,P.; Dolan,A.M.	2004	Arch.Orthop.Trauma Surg.	does not evaluate risk factors for PJI
Promoting quality through surveillance of surgical site infections: five prevention success stories	Geubbels,E.L.; Bakker,H.G.; Houtman,P.; van Noort-Klaassen,M.A.; Pelk,M.S.; Sassen,T.M.; Wille,J.C.	2004	Am.J.Infect.Control	not specific to pji
Mid-term to long-term followup of two-stage reimplantation for infected total knee arthroplasty	Haleem,A.A.; Berry,D.J.; Hanssen,A.D.	2004	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study
Conservative medical therapy of prosthetic joint infections: retrospective analysis of an 8-year experience	Pavoni,G.L.; Giannella,M.; Falcone,M.; Scorzolini,L.; Liberatore,M.; Carlesimo,B.; Serra,P.; Venditti,M.	2004	Clin.Microbiol.Infect.	not relevant to pico question
Antibiotic-loaded articulating cement spacer in the 2-stage exchange of infected total knee arthroplasty	Durbhakula,S.M.; Czajka,J.; Fuchs,M.D.; Uhl,R.L.	2004	J.Arthroplasty	not relevant. patients already had joint infection at start of the study
Two-stage revision hip arthroplasty for infection: comparison between the interim use of antibiotic-loaded cement beads and a spacer prosthesis	Hsieh,P.H.; Shih,C.H.; Chang,Y.H.; Lee,M.S.; Shih,H.N.; Yang,W.E.	2004	J.Bone Joint Surg.Am.	not relevant. patients already had joint infection at start of the study
Association between hospital and surgeon procedure volume and the outcomes of	Katz,J.N.; Barrett,J.; Mahomed,N.N.; Baron,J.A.;	2004	J.Bone Joint Surg.Am.	risk factors examined are not relevent to pico questions

total knee replacement	Wright,R.J.; Losina,E.			
The management of musculoskeletal infection in HIV carriers	Bahebeck,J.; Bedimo,R.; Eyenga,V.; Kouamfack,C.; Kingue,T.; Nierenet,M.; Sosso,M.	2004	Acta Orthop.Belg.	not specific to hip and knee pji
Suction dressings in total knee arthroplasty--an alternative to deep suction drainage	Panousis,K.; Grigoris,P.; Strover,A.E.	2004	Acta Orthop.Belg.	Not relevant to criteria
Eradication of methicillin resistant Staphylococcus aureus by "ring fencing" of elective orthopaedic beds	Biant,L.C.; Teare,E.L.; Williams,W.W.; Tuite,J.D.	2004	BMJ	quality improvement report
Risk factors for surgical-site infection following primary total knee arthroplasty	Minnema,B.; Vearncombe,M.; Augustin,A.; Gollish,J.; Simor,A.E.	2004	Infect.Control Hosp.Epidemiol.	risk factor analysis not specific to pji
Prophylactic use of antibiotic bone cement: an emerging standard--in the affirmative	Bourne,R.B.	2004	J.Arthroplasty	
Two-stage revision hip arthroplasty for infection with a custom-made, antibiotic-loaded, cement prosthesis as an interim spacer	Hsieh,P.H.; Chen,L.H.; Chen,C.H.; Lee,M.S.; Yang,W.E.; Shih,C.H.	2004	J.Trauma	not relevant. patients already had joint infection at start of the study
Surgical-site infections after orthopaedic surgery: statewide surveillance using linked administrative databases	Thomas,C.; Cadwallader,H.L.; Riley,T.V.	2004	J.Hosp.Infect.	infection outcome not specific to pji
The effect of universal leukoreduction on postoperative infections and length of hospital stay in elective orthopedic and cardiac surgery	Llewelyn,C.A.; Taylor,R.S.; Todd,A.A.; Stevens,W.; Murphy,M.F.; Williamson,L.M.	2004	Transfusion	comparison not relevant to pico question
Trends in the treatment of orthopaedic prosthetic infections	Bernard,L.; Hoffmeyer,P.; Assal,M.; Vaudaux,P.; Schrenzel,J.; Lew,D.	2004	J.Antimicrob.Chemother.	narrative review of treatment of pji
Total knee arthroplasty in patients with liver cirrhosis	Shih,L.Y.; Cheng,C.Y.; Chang,C.H.; Hsu,K.Y.; Hsu,R.W.; Shih,H.N.	2004	J.Bone Joint Surg.Am.	data comparing deep infection rates between cirrhosis and non cirrhosis patients not sufficiently presented. for analysis of risk factors in patients with cirrhosis, infection outcome is not specific to pji.

Long-term results of high tibial osteotomy for medial osteoarthritis of the knee	Pfahler,M.; Lutz,C.; Anetzberger,H.; Maier,M.; Hausdorf,J.; Pellengahr,C.; Refior,H.J.	2003	Acta Chir.Belg.	not arthroplasty study
Open debridement of acute gram-positive infections after total knee arthroplasty	Deirmengian,C.; Greenbaum,J.; Stern,J.; Braffman,M.; Lotke,P.A.; Booth,R.E.,Jr.; Lonner,J.H.	2003	Clin.Orthop.Relat.Res.	Not relevant to criteria
Immunoscintigraphy of septic loosening of knee endoprosthesis: a retrospective evaluation of the antigranulocyte antibody BW 250/183	Klett,R.; Kordelle,J.; Stahl,U.; Khalisi,A.; Puille,M.; Steiner,D.; Bauer,R.	2003	Eur.J.Nucl.Med.Mol.Imaging	unclear if all patients had total joint replacement
Efficacy of a single dose of cefazolin as a prophylactic antibiotic in primary arthroplasty	Tang,W.M.; Chiu,K.Y.; Ng,T.P.; Yau,W.P.; Ching,P.T.; Seto,W.H.	2003	J.Arthroplasty	confounded treatment study, since one drug received post op doses, and the other did not.
The combination of systemic antibiotics and antibiotics impregnated cement in primary total knee arthroplasty in patients of rheumatoid arthritis--evaluation of 60 knees	Liu,H.T.; Chiu,F.Y.; Chen,C.M.; Chen,T.H.	2003	J.Chin.Med.Assoc.	retrospective case series
Hip arthroplasty in patients with cirrhosis of the liver	Hsieh,P.H.; Chen,L.H.; Lee,M.S.; Chen,C.H.; Yang,W.E.; Shih,C.H.	2003	J.Bone Joint Surg.Br.	retrospective case series. infection rates among cirrhosis patients not compared to patients without liver disease for joint infection outcome
Body-exhaust suit versus occlusive clothing. A randomised, prospective trial using air and wound bacterial counts	Der,Tavitian J.; Ong,S.M.; Taub,N.A.; Taylor,G.J.	2003	J.Bone Joint Surg.Br.	Not relevant to criteria
Use of antibiotic-impregnated cement in total joint arthroplasty	Joseph,T.N.; Chen,A.L.; Di Cesare,P.E.	2003	J.Am.Acad.Orthop.Surg.	Narrative review
Incidence rates of dislocation, pulmonary embolism, and deep infection during the first six months after elective total hip replacement	Phillips,C.B.; Barrett,J.A.; Losina,E.; Mahomed,N.N.; Lingard,E.A.; Guadagnoli,E.; Baron,J.A.; Harris,W.H.; Poss,R.; Katz,J.N.	2003	J.Bone Joint Surg.Am.	risk factors for pji not evaluated
Comparison of a static with a mobile spacer in total knee infection	Emerson,R.H.,Jr.; Muncie,M.; Tarbox,T.R.; Higgins,L.L.	2002	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study

Antibiotic prophylaxis for dental or urological procedures following hip or knee replacement	Kingston,R.; Kiely,P.; McElwain,J.P.	2002	J.Infect.	not relevant to pico questions. was a survey of physician opinions
Total knee arthroplasty in hemophilic arthropathy	Norian,J.M.; Ries,M.D.; Karp,S.; Hambleton,J.	2002	J.Bone Joint Surg.Am.	for hemophilia patient: retrospective case series. for hiv: there were less than 25 patients in the non HIV group. for the immunocompromized analysis of CD4 lymphocyte counts, less than 25 patients had measurements.
Imaging of low-grade bone infection with a technetium-99m labelled monoclonal anti-NCA-90 Fab' fragment in patients with previous joint surgery	Ivancevic,V.; Perka,C.; Hasart,O.; Sandrock,D.; Munz,D.L.	2002	Eur.J.Nucl.Med.Mol.Imaging	Less than 25 in each group
The influence of preoperative nutritional status in wound healing after replacement arthroplasty	Rai,J.; Gill,S.S.; Kumar,B.R.	2002	Orthopedics	Not relevant to criteria
No changes in the distribution of organisms responsible for septic arthritis over a 20 year period	Dubost,J.J.; Soubrier,M.; De,Champs C.; Ristori,J.M.; Bussiere,J.L.; Sauvezie,B.	2002	Ann.Rheum.Dis.	does not answer risk factor pico question since all patients had PJI
Total hip replacement in sickle cell disease	Al-Mousawi,F.; Malki,A.; Al-Aradi,A.; Al-Bagali,M.; Al-Sadadi,A.; Booz,M.M.	2002	Int.Orthop.	retrospective case series
Hip prosthesis of antibiotic-loaded acrylic cement for the treatment of infections following total hip arthroplasty	Wentworth,S.J.; Masri,B.A.; Duncan,C.P.; Southworth,C.B.	2002	J.Bone Joint Surg.Am.	not relevant. patients already had joint infection at start of the study
The use of vancomycin-impregnated cement beads in the management of infection of prosthetic joints	Taggart,T.; Kerry,R.M.; Norman,P.; Stockley,I.	2002	J.Bone Joint Surg.Br.	not relevant. patients already had joint infection at start of the study
Infection in total knee replacement: a retrospective review of 6489 total knee replacements	Peersman,G.; Laskin,R.; Davis,J.; Peterson,M.	2001	Clin.Orthop.Relat.Res.	infection outcome not specific to pji
Serum and synovial vancomycin concentrations following prophylactic administration in knee arthroplasty	Eshkenazi,A.U.; Garti,A.; Tamir,L.; Hendel,D.	2001	Am.J.Knee Surg.	no relevant outcomes and non-consecutive case series
Relationship of the functional recovery after hip arthroplasty to the neuroendocrine and inflammatory responses	Hall,G.M.; Peerbhoy,D.; Shenkin,A.; Parker,C.J.; Salmon,P.	2001	Br.J.Anaesth.	Not relevant to criteria

Is homologous blood transfusion a risk factor for infection after hip replacement?	Steinitz,D.; Harvey,E.J.; Leighton,R.K.; Petrie,D.P.	2001	Can.J.Surg.	unclear if patients were anemic preoperatively
Improved method for detecting knee replacement infections based on extended combined 99mTc-white blood cell/bone imaging	Larikka,M.J.; Ahonen,A.K.; Junila,J.A.; Niemela,O.; Hamalainen,M.M.; Syrjala,H.P.	2001	Nucl.Med.Commun.	
Review of total hip replacement. The Middlemore Hospital experience, 1980-1991	Poon,P.C.; Rennie,J.; Gray,D.H.	2001	N.Z.Med.J.	does not evaluate risk factors for PJI
Effective bactericidal activity of tobramycin and vancomycin eluted from acrylic bone cement	Gonzalez,Della,V; Bostrom,M.; Brause,B.; Harney,C.; Salvati,E.A.	2001	Acta Orthop.Scand.	no patient oriented outcomes
Risk factors for infection in total hip replacement surgery at Hospital Kuala Lumpur	Yong,K.S.; Kareem,B.A.; Ruslan,G.N.; Harwant,S.	2001	Med.J.Malaysia	risk factors for PJI not evaluated
Role of knee aspiration after resection of the infected total knee arthroplasty	Lonner,J.H.; Siliski,J.M.; Della,Valle C.; DiCesare,P.; Lotke,P.A.	2001	Am.J.Orthop.(Belle.Mead.NJ.)	tests were evaluated after infected implants had already been removed
Postoperative infections following total knee replacement: an epidemiological study	Lazzarini,L.; Pellizzer,G.; Stecca,C.; Viola,R.; de,Lalla F.	2001	J.Chemother.	for most risk factors, less than 25 patients per group. for previous infection risk factor, cannot be used because the variable measured is combined reimplatation for infection and other reasons.
Rise in serum C reactive protein after hip and knee arthroplasties in patients with rheumatoid arthritis	Laiho,K.; Maenpaa,H.; Kautiainen,H.; Kauppi,M.; Kaarela,K.; Lehto,M.; Belt,E.	2001	Ann.Rheum.Dis.	not a PJI diagnostic study
The promising role of 18F-FDG PET in detecting infected lower limb prosthesis implants	Zhuang,H.; Duarte,P.S.; Pourdehnad,M.; Maes,A.; Van,Acker F.; Shnier,D.; Garino,J.P.; Fitzgerald,R.H.; Alavi,A.	2001	J.Nucl.Med.	Very low quality
The Norwegian Arthroplasty Register: 11 years and 73,000 arthroplasties	Havelin,L.I.; Engesaeter,L.B.; Espehaug,B.; Furnes,O.; Lie,S.A.; Vollset,S.E.	2000	Acta Orthop.Scand.	review
The PROSTALAC functional spacer in two-stage revision for infected knee replacements. Prosthesis of antibiotic-loaded acrylic cement	Haddad,F.S.; Masri,B.A.; Campbell,D.; McGraw,R.W.; Beauchamp,C.P.; Duncan,C.P.	2000	J.Bone Joint Surg.Br.	not relevant. patients already had joint infection at start of the study

Two-stage uncemented revision hip arthroplasty for infection	Haddad,F.S.; Muirhead-Allwood,S.K.; Manktelow,A.R.; Bacarese-Hamilton,I.	2000	J.Bone Joint Surg.Br.	not relevant. patients already had joint infection at start of the study
Wound infection in hip and knee arthroplasty	Gaine,W.J.; Ramamohan,N.A.; Hussein,N.A.; Hullin,M.G.; McCreath,S.W.	2000	J.Bone Joint Surg.Br.	Not relevant to criteria
White blood cell counts and differential in synovial fluid of aseptically failed total knee arthroplasty	Kersey,R.; Benjamin,J.; Marson,B.	2000	J.Arthroplasty	spectrum of patients in study not relevant to pico question, since only patients undergoing revision for aseptic reasons were included
99mTc-PEG liposomes for the scintigraphic detection of infection and inflammation: clinical evaluation	Dams,E.T.; Oyen,W.J.; Boerman,O.C.; Storm,G.; Laverman,P.; Kok,P.J.; Buijs,W.C.; Bakker,H.; van der Meer,J.W.; Corstens,F.H.	2000	J.Nucl.Med.	not specific to hip and kne
Perioperative lower urinary tract infections and deep sepsis in patients undergoing total joint arthroplasty	David,T.S.; Vrahas,M.S.	2000	J.Am.Acad.Orthop.Surg.	lit review
The use of prophylactic antimicrobial agents during and after hip arthroplasty	Hanssen,A.D.; Osmon,D.R.	1999	Clin.Orthop.Relat.Res.	Narrative review
The arthroscopic drainage, irrigation, and debridement of late, acute total hip arthroplasty infections: average 6-year follow-up	Hyman,J.L.; Salvati,E.A.; Laurencin,C.T.; Rogers,D.E.; Maynard,M.; Brause,D.B.	1999	J.Arthroplasty	less than 25 patients.
Total knee arthroplasty for steroid-induced osteonecrosis	Seldes,R.M.; Tan,V.; Duffy,G.; Rand,J.A.; Lotke,P.A.	1999	J.Arthroplasty	retrospective case series
Deterioration of theatre discipline during total joint replacement--have theatre protocols been abandoned?	Madhavan,P.; Blom,A.; Karagkevrakis,B.; Pradeep,M.; Huma,H.; Newman,J.H.	1999	Ann.R Coll.Surg.Engl.	Not relevant to criteria
The role of intraoperative Gram stain in revision total joint arthroplasty	Della Valle,C.J.; Scher,D.M.; Kim,Y.H.; Oxley,C.M.; Desai,P.; Zuckerman,J.D.; Di Cesare,P.E.	1999	J.Arthroplasty	>10% prostheses already removed
Hemicallotasis open-wedge osteotomy for osteoarthritis of the knee. Complications in 308 operations	Magyar,G.; Toksvig-Larsen,S.; Lindstrand,A.	1999	J.Bone Joint Surg.Br.	doesn't include arthroplasty patients
Wound complications after hip surgery using a tapeless compressive support	Hahn,G.J.; Grant,D.; Bartke,C.; McCartin,J.; Carn,R.M.	1999	Orthop.Nurs.	Not relevant to criteria

Antimicrobial substances and effects on sessile bacteria	Schierholz,J.M.; Beuth,J.; Konig,D.; Nurnberger,A.; Pulverer,G.	1999	Zentralbl.Bakteriol.	literature review
The hemispherical Harris-Galante acetabular cup, inserted without cement. The results of an eight to eleven-year follow-up of one hundred and sixty-eight hips	Petersen,M.B.; Poulsen,I.H.; Thomsen,J.; Solgaard,S.	1999	J.Bone Joint Surg.Am.	does not look at risk factors for pji
Infections associated with dental procedures in total hip arthroplasty	Laporte,D.M.; Waldman,B.J.; Mont,M.A.; Hungerford,D.S.	1999	J.Bone Joint Surg.Br.	not relevant. dental procedures occurred after surgery
Antimicrobial susceptibility of bacteria isolated from orthopedic implants following revision hip surgery	Tunney,M.M.; Ramage,G.; Patrick,S.; Nixon,J.R.; Murphy,P.G.; Gorman,S.P.	1998	Antimicrob.Agents Chemother.	in vitro
Septic arthritis of the knee following anterior cruciate ligament reconstruction: results of a survey of sports medicine fellowship directors	Matava,M.J.; Evans,T.A.; Wright,R.W.; Shively,R.A.	1998	Arthroscopy	not a PJI study
Contribution of laboratory tests, scintigraphy, and histology to the diagnosis of lower limb joint replacement infection	Rosas,M.H.; Leclercq,S.; Pegoix,M.; Darlas,Y.; Aubriot,J.H.; Rousselot,P.; Marcelli,C.	1998	Rev.Rhum.Engl.Ed.	<25 patients for most tests. inadequate quality for scintigraphy
Long-term elution of antibiotics from bone-cement: an in vivo study using the prosthesis of antibiotic-loaded acrylic cement (PROSTALAC) system	Masri,B.A.; Duncan,C.P.; Beauchamp,C.P.	1998	J.Arthroplasty	not relevant. patients already had joint infection at start of the study
Treatment of infection associated with segmental bone loss in the proximal part of the femur in two stages with use of an antibiotic-loaded interval prosthesis	Younger,A.S.; Duncan,C.P.; Masri,B.A.	1998	J.Bone Joint Surg.Am.	less than 25 patients per group, and patients already had infection at start of the study.
Acute pseudo-obstruction of the colon as a postoperative complication of hip arthroplasty	Clarke,H.D.; Berry,D.J.; Larson,D.R.	1997	J.Bone Joint Surg.Am.	no risk factors relevant to pico questions
Reconstruction of the hemipelvis after the excision of malignant tumours. Complications and functional outcome of prostheses	Abudu,A.; Grimer,R.J.; Cannon,S.R.; Carter,S.R.; Sneath,R.S.	1997	J.Bone Joint Surg.Br.	retrospective case series

Patient-related risk factors for early revision of total hip replacements. A population register-based case-control study of 674 revised hips	Espehaug,B.; Havelin,L.I.; Engesaeter,L.B.; Langeland,N.; Vollset,S.E.	1997	Acta Orthop.Scand.	risk factors such as use of diabetic drugs and bmi were measured after arthroplasty (cross-sectionally), instead of before surgery.
Risk infection factors in the total hip replacement	Fernandez,Arjona M.; Gomez-Sancha,F.; Peinado,Ibarra F.; Herruzo,Cabrera R.	1997	Eur.J.Epidemiol.	unclear if infection outcome is specific to pji.
Total knee replacement in young, active patients. Long-term follow-up and functional outcome	Diduch,D.R.; Insall,J.N.; Scott,W.N.; Scuderi,G.R.; Font-Rodriguez,D.	1997	J.Bone Joint Surg.Am.	retrospective case sereis
Psoriasis is a risk factor for hip-prosthesis infection	Drancourt,M.; Argenson,J.N.; Tissot,Dupont H.; Aubaniac,J.M.; Raoult,D.	1997	Eur.J.Epidemiol.	inadequate quality
Aseptic loosening of BonelocR cemented hip prostheses	Wedderkopp,N.; Andersen-Ranberg,F.; Andersen,M.B.; Termansen,N.B.	1997	Int.Orthop.	Systematic review
Culture of joint specimens in bacterial arthritis. Impact of blood culture bottle utilization	von,Essen R.	1997	Scand.J.Rheumatol.	not specific to hip and knee and insufficient data for 2x2 table.
Early mortality after cervical hip fractures	Levi,N.	1996	Injury	deep infections not stratified by institutionalization status
Two-stage cementless revision THR after infection. 5 recurrences in 40 cases followed 2.5-7 years	Lai,K.A.; Shen,W.J.; Yang,C.Y.; Lin,R.M.; Lin,C.J.; Jou,I.M.	1996	Acta Orthop.Scand.	not relevant. patients already had joint infection at start of the study
Rapid imaging of infections with a monoclonal antibody fragment (LeukoScan)	Becker,W.; Palestro,C.J.; Winship,J.; Feld,T.; Pinsky,C.M.; Wolf,F.; Goldenberg,D.M.	1996	Clin.Orthop.Relat.Res.	Not relevant to criteria
Once-daily ceftriaxone out-patient therapy for superficial wound infection following major orthopaedic operation	Nathan,S.S.; Williams,G.; Hounsel,N.; Hughes,S.P.	1996	Eur.J.Orthop.Surg.Traumatol.	not specific to arthroplasty patients
Diagnosis and management of the infected total knee arthroplasty	Simmons,T.D.; Stern,S.H.	1996	Am.J.Knee Surg.	Commentary review
Fracture of the metal tibial tray after Kinematic total knee replacement. A common cause of early aseptic failure	Abernethy,P.J.; Robinson,C.M.; Fowler,R.M.	1996	J.Bone Joint Surg.Br.	does not look for risk factors of infection

Total hip arthroplasty with Boneloc: loosening in 102/157 cases after 0.5-3 years	Nilsen,A.R.; Wiig,M.	1996	Acta Orthop.Scand.	does not evaluate risk factors for PJI
Incidence of deep sepsis in uncemented total hip arthroplasty using clean air facility as a function of antibiotic prophylaxis	Hauser,R.; Berchtold,W.; Schreiber,A.	1996	Bull.Hosp.Jt.Dis.	not relevant to pico question, since antibiotic is compared to no antibiotics, rather than other antibiotics.
Treatment of infected total knee arthroplasty using an articulating spacer	Hofmann,A.A.; Kane,K.R.; Tkach,T.K.; Plaster,R.L.; Camargo,M.P.	1995	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study
Postoperative infection following orthopaedic surgery in human immunodeficiency virus-infected hemophiliacs with CD4 counts < or = 200/mm3	Ragni,M.V.; Crossett,L.S.; Herndon,J.H.	1995	J.Arthroplasty	not specific to hip and knee replacement and retrospective case series
Wound drains in proximal femoral fracture surgery: a randomized prospective trial of 177 patients	Varley,G.W.; Milner,S.A.	1995	J.R Coll.Surg.Edinb.	Not relevant to criteria
The National Veterans Administration Surgical Risk Study: risk adjustment for the comparative assessment of the quality of surgical care	Khuri,S.F.; Daley,J.; Henderson,W.; Barbour,G.; Lowry,P.; Irvin,G.; Gibbs,J.; Grover,F.; Hammermeister,K.; Stremple,J.F.; .	1995	J.Am.Coll.Surg.	not specific to arthroplasty patients
Hip arthroplasty in patients with chronic renal failure	Lieberman,J.R.; Fuchs,M.D.; Haas,S.B.; Garvin,K.L.; Goldstock,L.; Gupta,R.; Pellicci,P.M.; Salvati,E.A.	1995	J.Arthroplasty	less than 25 patients per group. if dialysis and renal transplant groups were lumped together, it would be a retrospective case series.
Fine needle aspiration in infected hip replacements	Taylor,T.; Beggs,I.	1995	Clin.Radiol.	inadequate quality
Skin closure in hip surgery: subcuticular versus transdermal. A prospective randomized study	Sakka,S.A.; Graham,K.; Abdulah,A.	1995	Acta Orthop.Belg.	Unclear if tested PJI
Treatment of the infected total knee arthroplasty with insertion of another prosthesis. The effect of antibiotic-impregnated bone cement	Hanssen,A.D.; Rand,J.A.; Osmon,D.R.	1994	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study

Primary total hip arthroplasty using noncemented porous-coated femoral components in patients with osteonecrosis of the femoral head	Brinker,M.R.; Rosenberg,A.G.; Kull,L.; Galante,J.O.	1994	J.Arthroplasty	does not evaluate risk factors for PJI
Methicillin-resistant Staphylococcus epidermidis in infection of hip arthroplasties	James,P.J.; Butcher,I.A.; Gardner,E.R.; Hamblen,D.L.	1994	J.Bone Joint Surg.Br.	insufficent data for 2x2 table
One-stage revision of infected total hip replacements with discharging sinuses	Raut,V.V.; Siney,P.D.; Wroblewski,B.M.	1994	J.Bone Joint Surg.Br.	does not answer pico question
Diagnosis and management of the infected hip	Salvati,E.A.	1994	Orthopedics	Narrative review
Wound infection in total joint arthroplasty: effect of extended wound surveillance on wound infection rates	Taylor,S.; Pearce,P.; McKenzie,M.; Taylor,G.D.	1994	Can.J.Surg.	Not relevant to criteria
Preoperative assessment of skin colonization and antibiotic effectiveness in total knee arthroplasty	Tanzer,M.; Miller,J.; Richards,G.K.	1994	Clin.Orthop.Relat.Res.	Does not compare effectiveness of different antibiotics in preventing PJI
Uncemented total hip replacements and thigh pain	Petrou,G.; Gavras,M.; Diamantopoulos,A.; Kapetsis,T.; Kremmydas,N.; Kouzoupis,A.	1994	Arch.Orthop.Trauma Surg.	retrospective case series
Palacos gentamicin for the treatment of deep periprosthetic hip infections	Garvin,K.L.; Evans,B.G.; Salvati,E.A.; Brause,B.D.	1994	Clin.Orthop.Relat.Res.	not relevant patients already had joint infection at start of the study
Prophylaxis against infection in total joint arthroplasty. One day of cefuroxime compared with three days of cefazolin	Mauerhan,D.R.; Nelson,C.L.; Smith,D.L.; Fitzgerald,R.H.,Jr.; Slama,T.G.; Petty,R.W.; Jones,R.E.; Evans,R.P.	1994	J.Bone Joint Surg.Am.	different post operative treatment doses confound the comparison of the two drugs that is relevant to to pico question
Hip aspiration: a cost-effective and accurate method of evaluating the potentially infected hip prosthesis	Tigges,S.; Stiles,R.G.; Meli,R.J.; Roberson,J.R.	1993	Radiology	spectrum of patient in the study not representative of patients applicable to the pico question, resulting in an inadequate quality rating
Prognosis of total hip replacement in Sweden. Follow-up of 92,675 operations performed 1978-1990	Malchau,H.; Herberts,P.; Ahnfelt,L.	1993	Acta Orthop.Scand.	insufficient data. orthopedic departments, and not individual patients, were unit of analysis
A comparison of gentamicin-impregnated polymethylmethacrylate bead implantation to conventional parenteral	Nelson,C.L.; Evans,R.P.; Blaha,J.D.; Calhoun,J.; Henry,S.L.; Patzakis,M.J.	1993	Clin.Orthop.Relat.Res.	less than 25 patients per group

antibiotic therapy in infected total hip and knee arthroplasty				
Oral rifampin plus ofloxacin for treatment of Staphylococcus-infected orthopedic implants	Drancourt,M.; Stein,A.; Argenson,J.N.; Zannier,A.; Curvale,G.; Raoult,D.	1993	Antimicrob.Agents Chemother.	not relevant. study of pji treatment. also was a case series with concurrent treatments
Total hip arthroplasty in patients with diabetes mellitus	Moeckel,B.; Huo,M.H.; Salvati,E.A.; Pellicci,P.M.	1993	J.Arthroplasty	retrospective case series
Use of an antibiotic impregnated polymethyl methacrylate intramedullary spacer for complicated revision total hip arthroplasty	Kraay,M.J.; Goldberg,V.M.; Figgie,H.E.,III	1992	J.Arthroplasty	only 7 patients studied
Periprosthetic knee sepsis. The role of irrigation and debridement	Hartman,M.B.; Fehring,T.K.; Jordan,L.; Norton,H.J.	1991	Clin.Orthop.Relat.Res.	patients did not get arthroplasty
Postoperative urinary retention associated with total hip and total knee arthroplasties	Petersen,M.S.; Collins,D.N.; Selakovich,W.G.; Finkbeiner,A.E.	1991	Clin.Orthop.Relat.Res.	insufficient data to determine if UTI was associated with PJI
Infection in orthopaedic implants	Sanderson,P.J.	1991	J.Hosp.Infect.	narative review
Comparative study of skin closure in hip surgery	Clayer,M.; Southwood,R.T.	1991	Aust.N.Z.J.Surg.	Not relevant to criteria
The release of gentamicin after total hip replacement using low or high viscosity bone cement. A prospective, randomized study	Lindberg,L.; Onnerfalt,R.; Dingeldein,E.; Wahlig,H.	1991	Int.Orthop.	does not look at risk for pji as an outcome
The use of an antibiotic-impregnated spacer block for revision of the septic total knee arthroplasty	Henderson,M.H.,Jr.; Booth,R.E.,Jr.	1991	Semin.Arthroplasty	not relevant. patients already had joint infection at start of the study
Total knee arthroplasty in diabetes mellitus	England,S.P.; Stern,S.H.; Insall,J.N.; Windsor,R.E.	1990	Clin.Orthop.Relat.Res.	retrospective case series
Risk factors for wound infections after total knee arthroplasty	Gordon,S.M.; Culver,D.H.; Simmons,B.P.; Jarvis,W.R.	1990	Am.J.Epidemiol.	Not relevant to criteria
Prosthetic joint infections in the elderly	Powers,K.A.; Terpenning,M.S.; Voice,R.A.; Kauffman,C.A.	1990	Am.J.Med.	retrospective case series
Prophylaxis with systemic antibiotics versus gentamicin bone cement in total hip arthroplasty. A five-year survey of 1688 hips	Josefsson,G.; Gudmundsson,G.; Kolmert,L.; Wijkstrom,S.	1990	Clin.Orthop.Relat.Res.	repeat publication

Scintigraphic detection of bone and joint infections with indium-111-labeled nonspecific polyclonal human immunoglobulin G	Oyen,W.J.; Claessens,R.A.; van Horn,J.R.; van der Meer,J.W.; Corstens,F.H.	1990	J.Nucl.Med.	Patient population
The Bateman bipolar prosthesis in osteoarthritis and rheumatoid arthritis. A review of 400 cases	Vazquez-Vela,G.; Vazquez-Vela,E.; Garcia,Dobarganes F.	1990	Clin.Orthop.Relat.Res.	in adequate quality due to no confounding adjustment, loss to follow up, and lack of description of research methodology
Tc-99m HM-PAO labelled leucocyte scanning for detection of infection in orthopedic surgery	Verlooy,H.; Mortelmans,L.; Verbruggen,A.; Stuyck,J.; Boogaerts,M.; De,Roo M.	1990	Prog.Clin.Biol.Res.	Not relevant to criteria
Deep infection of cemented total hip arthroplasties caused by coagulase-negative staphylococci	Hope,P.G.; Kristinsson,K.G.; Norman,P.; Elson,R.A.	1989	J.Bone Joint Surg.Br.	insufficient data to answer pico question. only patients who had antibiotic cement and later developed infection were considered, instead of evaluating all patients who had cement.
Comparison of intraoperative versus 24 hour antibiotic prophylaxis in total joint replacement. A controlled prospective study	Ritter,M.A.; Campbell,E.; Keating,E.M.; Faris,P.M.	1989	Orthop.Rev.	not relevant to pico question. compares post op cefuroxime to no postop cefuroxime
Acute and subacute deep infection after uncemented total hip replacement using antibacterial prophylaxis	Hill,G.E.; Droller,D.G.	1989	Orthop.Rev.	doesn't answer pico question and retrospective case series
Revision operations on infected total hip arthroplasties. Two- to nine-year follow-up study	Sanzen,L.; Carlsson,A.S.; Josefsson,G.; Lindberg,L.T.	1988	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study
The long-term results of the Howse total hip arthroplasty. With particular reference to those requiring revision	Roberts,J.A.; Finlayson,D.F.; Freeman,P.A.	1987	J.Bone Joint Surg.Br.	less than 25 patients had Rheumatoid arthritis, so this study could not be used to evaluate RA as a risk factor for infection
Urinary tract sequelae: possible influence on joint infections following total joint replacement	Ritter,M.A.; Fechtman,R.W.	1987	Orthopedics	not relevant to pico question, since prognostic factor evaluated was UTI in pre or perioperative period
A comparison of systemic cefuroxime and cefuroxime loaded bone cement in the prevention of early infection after total joint replacement	McQueen,M.; Littlejohn,A.; Hughes,S.P.	1987	Int.Orthop.	repeat data from another trial
Failures and reoperations following low-friction arthroplasty of the hip. A five- to fifteen-year follow-up study	Eftekhar,N.S.; Tzitzikalakis,G.I.	1986	Clin.Orthop.Relat.Res.	does not evaluate risk factors for PJI

One-stage revision of infected cemented total hip arthroplasty	Wroblewski,B.M.	1986	Clin.Orthop.Relat.Res.	not relevant. patients already had joint infection at start of the study
Dental treatment and late prosthetic joint infections	Jacobson,J.J.; Millard,H.D.; Plezia,R.; Blankenship,J.R.	1986	Oral Surg.Oral Med.Oral Pathol.	dental procedures occurred after joint replacement in some patients.
Deep sepsis following total knee arthroplasty. Ten-year experience at the University of California at Los Angeles Medical Center	Grogan,T.J.; Dorey,F.; Rollins,J.; Amstutz,H.C.	1986	J.Bone Joint Surg.Am.	Not relevant to criteria
99Tcm-MDP, 67Ga-citrate and 111In-leucocytes for detecting prosthetic hip infection	Mountford,P.J.; Hall,F.M.; Wells,C.P.; Coakley,A.J.	1986	Nucl.Med.Commun.	Very low quality
Extended follow-up of patients suspected of having joint sepsis after total joint replacement	Lidwell,O.M.; Lowbury,E.J.; Whyte,W.; Blowers,R.; Lowe,D.	1985	J.Hyg.(Lond.)	Doesn't answer pico question of whether previous infection predicts pji, since the risk factor being studied was suspected, but not confirmed, sepsis occurring after the joint was replace.
Indium-111 chloride imaging in the detection of infected prostheses	Sayle,B.A.; Fawcett,H.D.; Wilkey,D.J.; Cierny,G.,III; Mader,J.T.	1985	J.Nucl.Med.	Patient population
Diagnostic value of bone scintigraphy in the complications of total replacement of the hip	Magyari,Z.; Fekete,G.; Molnar,G.	1985	Acta Chir.Hung.	Case series
Reimplantation for salvage of the infected hip: rationale for the use of gentamicin-impregnated cement and beads	Callaghan,J.J.; Salvati,E.A.; Brause,B.D.; Rimnac,C.M.; Wright,T.M.	1985	Hip	not relevant. patients already had joint infection at start of the study
The infected hip after total hip arthroplasty	Canner,G.C.; Steinberg,M.E.; Heppenstall,R.B.; Balderston,R.	1984	J.Bone Joint Surg.Am.	not relevent. study evaluates antibiotics versus revision for treatment of infection
Infection and sepsis after operations for total hip or knee-joint replacement: influence of ultraclean air, prophylactic antibiotics and other factors	Lidwell,O.M.; Lowbury,E.J.; Whyte,W.; Blowers,R.; Stanley,S.J.; Lowe,D.	1984	J.Hyg.(Lond.)	repeat data from lidwell(1982)
Use of antibiotic-containing bone cement	Murray,W.R.	1984	Clin.Orthop.Relat.Res.	unclear if any of the revision patients were revised for infection
Antibiotic-loaded acrylic cement: current concepts	Buchholz,H.W.; Elson,R.A.; Heinert,K.	1984	Clin.Orthop.Relat.Res.	Narrative review
The use of preventive antibiotics in	Williams,D.N.; Gustilo,R.B.	1984	Clin.Orthop.Relat.Res.	review

orthopaedic surgery				
Pharmacokinetics of topical gentamicin in total hip arthroplasty	Sorensen,T.S.; Andersen,M.R.; Glenthoj,J.; Petersen,O.	1984	Acta Orthop.Scand.	less than 25 patients per group
Posterior approach for total hip arthroplasty. A study of postoperative course, early results and early complications in 131 cases	Patiala,H.; Lehto,K.; Rokkanen,P.; Paavolainen,P.	1984	Arch.Orthop.Trauma Surg.	does not examine risk factors for pji
Charnley low-friction arthroplasty in diabetic patients	Menon,T.J.; Thjellesen,D.; Wroblewski,B.M.	1983	J.Bone Joint Surg.Br.	could only be used as a retrospective case series. they compare infection rates in their series to results of nondiabetic patients in other published studies.
Indium-111 leucocyte scanning in the evaluation of painful hip arthroplasty	Mulamba,L.; Ferrant,A.; Leners,N.; de,Nayer P.; Rombouts,J.J.; Vincent,A.	1983	Acta Orthop.Scand.	Very low quality
Prevention and treatment of deep infection following total hip replacement	Josefsson,G.	1983	Can.J.Surg.	Systematic review
Radionuclide joint imaging	Esdaile,J.; Rosenthall,L.	1983	Compr.Ther	Narrative review
The influence of the total body exhaust suit on air and wound contamination in elective hip-operations	Blomgren,G.; Hambraeus,A.; Malmborg,A.S.	1983	J.Hosp.Infect.	Not relevant to criteria
Infection after total hip replacement. With special reference to a discharge from the wound	Surin,V.V.; Sundholm,K.; Backman,L.	1983	J.Bone Joint Surg.Br.	no risk factors relevant to pico questions
Charnley low-friction arthroplasty in patients with psoriasis	Menon,T.J.; Wroblewski,B.M.	1983	Clin.Orthop.Relat.Res.	could only be used as a retrospective case series. they compare infection rates in their series to results of non-psoriasis patients in other published studies.
Tobramycin in bone cement. An in-depth analysis of wound, serum, and urine concentrations in patients undergoing total hip revision arthroplasty	Soto-Hall,R.; Saenz,L.; Tavernetti,R.; Cabaud,H.E.; Cochran,T.P.	1983	Clin.Orthop.Relat.Res.	Less than 25 in each group
Total hip arthroplasties in patients less than forty-five years old	Dorr,L.D.; Takei,G.K.; Conaty,J.P.	1983	J.Bone Joint Surg.Am.	does not evaluate risk factors for PJI
Effects of using a Charnley-Howorth enclosure in a district general hospital	Bintcliffe,I.W.	1983	J.R Soc.Med.	confouding treatments since post intervention group had surgery with both ultraclean air system and exhaust suits. it would be impossible to separate effect of each

				intervention
Radiologic evaluation of painful joint prostheses	Schneider,R.; Freiberger,R.H.; Ghelman,B.; Ranawat,C.S.	1982	Clin.Orthop.Relat.Res.	Commentary review
Cefoxitin antibiotic concentration in bone and synovial fluid	Schurman,D.J.; Burton,D.S.; Kajiyama,G.	1982	Clin.Orthop.Relat.Res.	no relevant comparison group. was a case series.
Fatal pulmonary embolism after total hip replacement	Fredin,H.O.; Nillius,A.S.	1982	Acta Orthop.Scand.	not relevant. does not evaluate risk factors for pji
Prophylactic cefuroxime in total joint replacement	Hughes,S.P.; Want,S.; Darrell,J.H.; Dash,C.H.; Kennedy,M.	1982	Int.Orthop.	not relevant. does not compare antibiotics
Prophylactic cefazolin versus placebo in total hip replacement. Report of a multicentre double-blind randomised trial	Hill,C.; Flamant,R.; Mazas,F.; Evrard,J.	1981	Lancet	unclear if infection outcome included superficial infections
Surgical wound infection occurrence in clean operations; risk stratification for interhospital comparisons	Ehrenkranz,N.J.	1981	Am.J.Med.	Not relevant to criteria
The effect of the combined use of a clean air system and one day prophylactic administration of cefamandole in total hip replacement	Mulier,J.C.; Cheng,N.; Van,Tornout B.; Vandepitte,J.; Debruyne,H.	1981	Arch.Orthop.Trauma Surg.	case series with multiple(confounding) treatments
Function of fifty-seven septic, revised and healed total hip arthroplasties	Carlsson,A.S.; Josefsson,G.; Lindberg,L.	1980	Acta Orthop.Scand.	not relevant. patients already had joint infection at start of the study
Total hip replacement in a laminar flow environment with special reference to deep infections	Ha'eri,G.B.; Wiley,A.M.	1980	Clin.Orthop.Relat.Res.	Not relevant to criteria
Results with the constrained total knee prosthesis in treating severely disabled patients and patients with failed total knee replacements	Bargar,W.L.; Cracchiolo,A.,III; Amstutz,H.C.	1980	J.Bone Joint Surg.Am.	does not evaluate risk factors for PJI
Reconstruction of the knee with endoprosthesis in rheumatoid arthritis: a report of 112 consecutive cases operated upon from 1973 through 1977	Larsson,S.E.	1979	Clin.Orthop.Relat.Res.	does not look at risk factors for PJI
Primary postoperative wound infection due to Staphylococcus pyogenes	Smith,G.	1979	Curr Probl.Surg.	Narrative review

Revision with gentamicin-impregnated cement for deep infections in total hip arthroplasties	Carlsson,A.S.; Josefsson,G.; Lindberg,L.	1978	J.Bone Joint Surg.Am.	not relevant. patients already had joint infection at start of the study
The effect of antibiotic additions on the mechanical properties of acrylic cement	Nelson,R.C.; Hoffman,R.O.; Burton,T.A.	1978	J.Biomed Mater.Res.	no relevant outcomes to pico question
The penetration characteristics of cefazolin, cephalothin, and cephradine into bone in patients undergoing total hip replacement	Cunha,B.A.; Gossling,H.R.; Pasternak,H.S.; Nightingale,C.H.; Quintiliani,R.	1977	J.Bone Joint Surg.Am.	no relevant outcome to pico question
Prophylactic antibiotics against early and late deep infections after total hip replacements	Carlsson,A.K.; Lidgren,L.; Lindberg,L.	1977	Acta Orthop.Scand.	not relvant comparison to pico question, since antibiotic was compared to passive controls
Urinary infections in total hip arthroplasty. Influences of prophylactic cephalosporins and catheterization	Donovan,T.L.; Gordon,R.O.; Nagel,D.A.	1976	J.Bone Joint Surg.Am.	does not evaluate risk factors for PJI
The plastic surgical adhesive drape: an evaluation of its efficacy as a microbial barrier	French,M.L.; Eitzen,H.E.; Ritter,M.A.	1976	Ann.Surg.	Less than 25 in each group
Infection following total hip replacement in a general hospital without special orthopaedic facilities	Benson,M.K.; Hughes,S.P.	1975	Acta Orthop.Scand.	Not relevant to criteria
Antibiotic bone penetration. Concentrations of methicillin and clindamycin phosphate in human bone taken during total hip replacement	Schurman,D.J.; Johnson,B.L.,Jr.; Finerman,G.; Amstutz,H.C.	1975	Clin.Orthop.Relat.Res.	less than 25 patients per group
The effect of operating-room environment on the infection rate after Charnley low-friction total hip replacement	Brady,L.P.; Enneking,W.F.; Franco,J.A.	1975	J.Bone Joint Surg.Am.	Not relevant to criteria
The use of an antibiotic bone cement combination as a different approach to the elimination of infection in total hip replacement	Medcraft,J.W.; Gardner,A.D.	1974	Med.Lab.Technol.	in vitro
Subacute sepsis of the hip treated by antibiotics and cemented prosthesis	Wilson,P.D.,Jr.; Aglietti,P.; Salvati,E.A.	1974	J.Bone Joint Surg.Am.	not relevant. patients already had joint infection at start of the study
Cloxacillin in the prophylaxis of postoperative infections of the hip	Ericson,C.; Lidgren,L.; Lindberg,L.	1973	J.Bone Joint Surg.Am.	unclear how many deep infections occurred in the arthroplasty subgroup

Postoperative infection after total hip replacement with special reference to air contamination in the operating room	Charnley,J.	1972	Clin.Orthop.Relat.Res.	Narrative review
Allogeneic Blood Transfusion Is a Significant Risk Factor for Surgical-Site Infection Following Total Hip and Knee Arthroplasty: A Meta-Analysis	Kim,J.L.; Park,J.-H.; Han,S.-B.; Cho,I.Y.; Jang,K.-M.	2017	Journal of Arthroplasty	meta analysis
Survivorship After Primary Total Hip Arthroplasty in Solid-Organ Transplant Patients	Chalmers,B.P.; Ledford,C.K.; Statz,J.M.; Perry,K.I.; Mabry,T.M.; Hanssen,A.D.; Abdel,M.P.	2016	Journal of Arthroplasty	does not answer pico question because risk of infection because risk of revision for infection is compared between patients who recieve different types of organ transplants, and not compared to patients who are not immunocompromised from recieving organ transplants.
The Diagnosis of Infection in Metal-on-Metal Hip Arthroplasties	Grammatopoulos,G.; Munemoto,M.; Inagaki,Y.; Tanaka,Y.; Athanasou,N.A.	2016	Journal of Arthroplasty	spectrum of patients not representative of all patients relevant to PICO question, since none of the included patients were thought to have PJI before revision. therefore the article would be inadequate quality to answer PICO question
Metal on Metal or Ceramic on Ceramic for Cementless Total Hip Arthroplasty: A Meta-Analysis	Lee,Y.-K.; Yoon,B.-H.; Choi,Y.S.; Jo,W.-L.; Ha,Y.-C.; Koo,K.-H.	2016	Journal of Arthroplasty	Meta analysis
Does cemented or cementless single-stage exchange arthroplasty of chronic periprosthetic hip infections provide similar infection rates to a two-stage? A systematic review	George,D.A.; Logoluso,N.; Castellini,G.; Gianola,S.; Scarponi,S.; Haddad,F.S.; Drago,L.; Romano,C.L.	2016	BMC Infectious Diseases	Systematic review
Human Immunodeficiency Virus and Total Joint Arthroplasty: The Risk for Infection Is Reduced	Enayatollahi,M.A.; Murphy,D.; Maltenfort,M.G.; Parvizi,J.	2016	Journal of Arthroplasty	meta-analysis
Risk of Reinfection After Treatment of Infected Total Knee Arthroplasty	Cochran,A.R.; Ong,K.L.; Lau,E.; Mont,M.A.; Malkani,A.L.	2016	Journal of Arthroplasty	was a study of reinfection after first line treatment for PJI, but not all patients in the study were treated with revision arthroplasty
Synovial fluid C-reactive protein as a diagnostic marker for periprosthetic joint infection: A systematic review and meta-analysis	Wang,C.; Wang,Q.; Li,R.; Duan,J.-Y.; Wang,C.-B.	2016	Chinese Medical Journal	Systematic review

Intra-articular steroid injections and risk of infection following total hip replacement or total knee replacement: A meta-analysis of cohort studies	Meng,F.-T.; Gong,B.-B.; Yang,G.; Zhang,Y.-Z.; Ding,W.-Y.; Shen,Y.	2016	International Journal of Clinical and Experimental Medicine	Meta analysis
Single vs Repeat Surgical Skin Preparations for Reducing Surgical Site Infection After Total Joint Arthroplasty: A Prospective, Randomized, Double-Blinded Study	Morrison,T.N.; Chen,A.F.; Taneja,M.; KÃ?Â¼Ã?Â§Ã?Â¼kdurmaz,F.; Rothman,R.H.; Parvizi,J.	2016	Journal of Arthroplasty	Not relevant to criteria
Frequent dental scaling is associated with a reduced risk of periprosthetic infection following total knee arthroplasty: A nationwide population-based nested case-control study	Tai,T.-W.; Lin,T.-C.; Ho,C.-J.; Yang,Y.-H.; Yang,C.-Y.	2016	PLoS One	doesn't answer pico question. Dental health was mostly measured in the years after TJA
Body mass and weight thresholds for increased prosthetic joint infection rates after primary total joint arthroplasty	LÃ?Â¼bbeke,A.; Zingg,M.; Vu,D.; Miozzari,H.H.; Christofilopoulos,P.; UÃ?Â§kay,I.; Harbarth,S.; Hoffmeyer,P.	2016	Acta Orthopaedica	repeat data
Neutrophil to lymphocyte ratio may be a diagnostic marker for prosthetic joint infection	GÃ?Â¶lge,U.H.; Kaymaz,B.; PazarcÃ?Â±,Ã?-; KÃ?Â±lÃ?Â±nÃ?Â§,S.; Ã?-ztemur,Z.; Bulut,O.	2016	Journal of Clinical and Analytical Medicine	Not relevant to criteria
Periprosthetic joint infections in modular endoprostheses of the lower extremities: A retrospective observational study in 101 patients	Zajonz,D.; Zieme,A.; Prietzel,T.; Moche,M.; Tiepoldt,S.; Roth,A.; Josten,C.; von Salis-Soglio,G.F.; Heyde,E.; Ghanem,M.	2016	Patient Safety in Surgery	not specific to hip and knee replacement
Clinical Presentation, Risk Factors, and Outcomes of Hematogenous Prosthetic Joint Infection in Patients with Staphylococcus aureus Bacteremia	Tande,A.J.; Palraj,B.R.; Osmon,D.R.; Berbari,E.F.; Baddour,L.M.; Lohse,C.M.; Steckelberg,J.M.; Wilson,W.R.; Sohail,M.R.	2016	American Journal of Medicine	not specific to hip and knee arthroplasty
The QuickLine IL-6 lateral flow immunoassay improves the rapid intraoperative diagnosis of suspected periprosthetic joint infections	Wimmer,M.D.; Ploeger,M.M.; Friedrich,M.J.; Bornemann,R.; Roessler,P.P.; Gravius,S.; Randau,T.M.	2016	Technology and Health Care	Less than 25 in each group
Positive culture during reimplantation increases the risk of subsequent failure in	Tan,T.L.; Gomez,M.M.; Manrique,J.; Parvizi,J.;	2016	Journal of Bone and Joint Surgery - American Volume	Not relevant to criteria

two-stage exchange arthroplasty	Chen,A.F.			
The effect of intra-wound vancomycin powder application in reducing surgical site infections after total hip arthroplasty	Omrani,F.A.; Emami,M.; Sarzaeem,M.; Zarei,R.; Yeganeh,A.	2015	Biosciences Biotechnology Research Asia	infection outcome not specific to pji
The role of ultrasonography in the assessment of peri-prosthetic hip complications	Sdao,S.; Orlandi,D.; Aliprandi,A.; Lacelli,F.; Sconfienza,L.M.; Randelli,F.; Sardanelli,F.; Serafini,G.	2015	Journal of Ultrasound	Narrative review
Limitations of Gram staining for the diagnosis of infections following total hip or knee arthroplasty	Ouyang,Z.; Zhai,Z.; Qin,A.; Li,H.; Liu,X.; Qu,X.; Dai,K.	2015	Experimental and Therapeutic Medicine	Meta analysis
Prosthesis infection: diagnosis after total joint arthroplasty with three-phase bone scintigraphy	Ouyang,Z.; Li,H.; Liu,X.; Zhai,Z.; Li,X.	2014	Annals of Nuclear Medicine	Meta analysis
Antibiotic prophylaxis for dental procedures at risk of causing bacteremia among post-total joint arthroplasty patients: A survey of canadian orthopaedic surgeons and dental surgeons	Colterjohn,T.; De,Beer J.; Petruccelli,D.; Zabtia,N.; Winemaker,M.	2014	Journal of Arthroplasty	not relevant to pico questions. was a survey of physician attitudes and practices
Total joint arthroplasty: Should patients have preoperative dental clearance?	Lampley,A.; Huang,R.C.; Arnold,W.V.; Parvizi,J.	2014	Journal of Arthroplasty	inadequate quality. inclusion criteria for dental clearance and non-clearance patients was different, leading to very high risk of confounding. also data collection methods between group was different.
Prevention methodologies against infection after total joint arthroplasty	Kapadia,B.H.; Johnson,A.J.; Issa,K.; Naziri,Q.; Daley,J.A.; Mont,M.A.	2012	Current Orthopaedic Practice	Systematic review
The Infected Hip: Avoidance and Treatment	Del Gaizo,D.J.; Della Valle,C.J.	2012	Seminars in Arthroplasty	Narrative review
Promising roles of PET in management of arthroplasty-associated infection	Saboury,B.; Ziai,P.; Parsons,M.; Zhuang,H.; Basu,S.; Alavi,A.	2012	PET Clinics	Commentary review
The effects of positive blood cultures after surgery on the outcomes of total joint arthroplasty	George,J.; Murray,T.G.; Klika,A.K.; Molloy,R.; Krebs,V.E.; Barsoum,W.K.	2012	Current Orthopaedic Practice	Not relevant to criteria

Blister formation with negative pressure dressings after total knee arthroplasty	Howell,R.D.; Hadley,S.; Strauss,E.; Pelham,F.R.	2011	Current Orthopaedic Practice	Narrative review
Do resistant organisms affect success of two-stage reimplantation for prosthetic hip infections?	Murray,T.G.; Cochran,J.; Klika,A.K.; Krebs,V.E.; Barsoum,W.K.	2011	Current Orthopaedic Practice	not relevant. patients already had joint infection at start of the study
Total knee arthroplasty on the disease activity of rheumatoid arthritis	Ryu,J.; Aibe,K.; Sakamoto,A.; Simizu,I.	1998	Japanese Journal of Rheumatology	Not relevant to criteria
Novel biomarkers to detect infection in revision hip and knee arthroplasties infection	Glehr,M.; Friesenbichler,J.; Hofmann,G.; Bernhardt,G.A.; Zacherl,M.; Avian,A.; Windhager,R.; Leithner,A.	2013	Clinical Orthopaedics and Related Research	patient spectrum not representative of population defined in pico question. excluded obese patients
Prevalence of asymptomatic bacteriuria in knee arthroplasty patients and subsequent risk of prosthesis infection	Martinez,Velez D.; Gonzalez,Fernandez E.; Esteban,J.; Cordero,Ampuero J.	2016	European journal of orthopaedic surgery & traumatology : orthopedie.traumatologie	less than 25 patients had asymptomatic bacteriuria
Acetabular spacers in two stage hip revision: Does it worth? a controlled clinical trial	Burastero,G.; Carrega,G.; Basso,M.; Cavagnaro,L.; Felli,L.	2015	HIP International	conferenct abstract, and looks at patients who halready had infection
Diagnosing infection in the failed joint replacement: a comparison of coincidence detection 18F-FDG and 111In-labeled leukocyte/99mTc-sulfur colloid marrow imaging	Love,C.; Marwin,S.E.; Tomas,M.B.; Krauss,E.S.; Tronco,G.G.; Bhargava,K.K.; Nichols,K.J.; Palestro,C.J.	2004	Journal of nuclear medicine : official.publication., Society of Nuclear Medicine	not all patients had total joint arthroplasty. 3 had hemiarthroplasty
Incisional negative pressure wound therapy dressings (inpWTd) in routine primary hip and knee arthroplasties: A randomised controlled trial	Karlakki,S.L.; Hamad,A.K.; Whittall,C.; Graham,N.M.; Banerjee,R.D.; Kuiper,J.H.	2016	Bone and Joint Research	Not relevant to criteria
The value of (18)FDG-PET for the detection of infected hip prosthesis	Vanquickenborne,B.; Maes,A.; Nuyts,J.; Acker,F.; Stuyck,J.; Mulier,M.; Verbruggen,A.; Mortelmans,L.	2003	European journal of nuclear medicine and molecular imaging	Not relevant to criteria
Comparative multicenter trial of teicoplanin versus cefazolin for antimicrobial prophylaxis in prosthetic joint implant surgery	Periti,P.; Stringa,G.; Mini,E.	1999	European journal of clinical microbiology & infectious diseases	repeat article
The Chitranjan Ranawat Award: Should prophylactic antibiotics be withheld before revision surgery to obtain	Tetreault,M.W.; Wetters,N.G.; Aggarwal,V.; Mont,M.; Parvizi,J.; Della-Valle,C.J.	2014	Clinical Orthopaedics and Related Research	no relevant outcomes

appropriate cultures? Knee				
Analgesic effectiveness of celecoxib and diclofenac in patients with osteoarthritis of the hip requiring joint replacement surgery: a 12-week, multicenter, randomized, double-blind, parallel-group, double-dummy, noninferiority study	Emery,P.; Koncz,T.; Pan,S.; Lowry,S.	2008	Clinical Therapeutics	not a study of antibiotics
Antibiotic prophylaxis in total hip replacement	Pollard,J.P.; Hughes,S.P.; Scott,J.E.; Evans,M.J.; Benson,M.K.	1979	British Medical Journal	confounded treatment comparison that doesn't answer pico question. different lengths of post op treatment could confound differences between the type of antibiotics used.
The prophylactic use of antibiotics in alloarthroplasty of the hip joint for coxarthrosis. A randomized study	Schulitz,K.P.; Winkelmann,W.; Schoening,B.	1980	ARCH.ORTHOP.TRAUM.SURG.	antibiotics given post surgery
Screening Patients Undergoing Total Hip or Knee Arthroplasty with Perioperative Urinalysis and the Effect of a Practice Change on Antimicrobial Use	Bailin,S.; Noiseux,N.; Pottinger,J.M.; Johannsson,B.; Haleem,A.; Johnson,S.; Herwaldt,L.A.	2017	Infect.Control Hosp.Epidemiol.	infection outcome not specific to pji
Leukocyte Esterase Strip Test Can Predict Subsequent Failure Following Reimplantation in Patients With Periprosthetic Joint Infection	Kheir,M.M.; Ackerman,C.T.; Tan,T.L.; Benazzo,A.; Tischler,E.H.; Parvizi,J.	2017	J.Arthroplasty	evaluates tests in a cohort in which infected implant had already been removed
Pre-operative intra-articular deep tissue sampling with novel retrograde forceps improves the diagnostics in periprosthetic joint infection	Wimmer,M.D.; Ploeger,M.M.; Friedrich,M.J.; Hugle,T.; Gravius,S.; Randau,T.M.	2017	Int.Orthop	test not relevant to pico question
What is the Accuracy of Nuclear Imaging in the Assessment of Periprosthetic Knee Infection? A Meta-analysis	Verberne,S.J.; Sonnega,R.J.; Temmerman,O.P.; Raijmakers,P.G.	2017	Clin.Orthop Relat.Res.	Meta analysis
Qualitative alpha-defensin test (Synovasure) for the diagnosis of periprosthetic infection in revision total joint arthroplasty	Sigmund,I.K.; Holinka,J.; Gamper,J.; Staats,K.; Bohler,C.; Kubista,B.; Windhager,R.	2017	Bone Joint J.	Patient population
Increased rate of bacterial colonization on PE-components in total joint arthroplasty: An evaluation through sonication	Janz,V.; Wassilew,G.I.; Perka,C.F.; Bartek,B.	2017	Technol.Health Care	insufficient data for a diagnostic 2x2 table

The Accuracy of Imaging Techniques in the Assessment of Periprosthetic Hip Infection: A Systematic Review and Meta-Analysis	Verberne,S.J.; Raijmakers,P.G.; Temmerman,O.P.	2016	J.Bone Joint Surg.Am.	Systematic review
EKA survey: diagnosis of prosthetic knee joint infection	Ahmad,S.S.; Becker,R.; Chen,A.F.; Kohl,S.	2016	Knee Surg.Sports Traumatol.Arthrosc.	Systematic review
Neutrophil-to-lymphocyte ratio (NLR) distribution shows a better kinetic pattern than C-reactive protein distribution for the follow-up of early inflammation after total knee arthroplasty	Yombi,J.C.; Schwab,P.E.; Thienpont,E.	2016	Knee Surg.Sports Traumatol.Arthrosc.	Not relevant to criteria
Diagnosing Infection in the Setting of Periprosthetic Fractures	Shah,R.P.; Plummer,D.R.; Moric,M.; Sporer,S.M.; Levine,B.R.; Della Valle,C.J.	2016	J.Arthroplasty	Not relevant to criteria
Variations in ESR and CRP in total knee arthroplasty and total hip arthroplasty in Iranian patients from 2009 to 2011	Nazem,K.; Motififard,M.; Yousefian,M.	2016	Adv.Biomed Res.	not relevant to pico question. was a natural history study rather than a diagnostic study
Validation of the diagnosis 'prosthetic joint infection' in the Danish Hip Arthroplasty Register	Gundtoft,P.H.; Pedersen,A.B.; Schonheyder,H.C.; Overgaard,S.	2016	Bone Joint J.	insufficient data to answer pico question, since objective was to validate pji diagnoses in the DHR. since specific index tests or combinations of tests that were used was unclear, this can not be used to answer the pico question
An evaluation of the role of nuclear medicine imaging in the diagnosis of periprosthetic infections of the hip	Trevail,C.; Ravindranath-Reddy,P.; Sulkin,T.; Bartlett,G.	2016	Clin.Radiol.	Very low quality
Comparative analysis of dual-phase 18F-fluoride PET/CT and three phase bone scintigraphy in the evaluation of septic (or painful) hip prostheses: A prospective study	Kumar,R.; Kumar,R.; Kumar,V.; Malhotra,R.	2016	J.Orthop Sci.	Very low quality
The role of bone SPECT/CT in the evaluation of painful joint prostheses	Arican,P.; Okudan,Tekin B.; Sefizade,R.; Naldoken,S.; Bastug,A.; Ozkurt,B.	2015	Nucl.Med.Commun.	Insufficient data for 2x2 table
Seronegative infections in hip and knee arthroplasty: periprosthetic infections with normal erythrocyte sedimentation rate and C-reactive protein level	McArthur,B.A.; Abdel,M.P.; Taunton,M.J.; Osmon,D.R.; Hanssen,A.D.	2015	Bone Joint J.	patient spectrum not representative of population defined in pico question

How accurate are orthopedic surgeons in diagnosing periprosthetic joint infection after total knee arthroplasty?: A multicenter study	Koh,I.J.; Cho,W.S.; Choi,N.Y.; Parvizi,J.; Kim,T.K.	2015	Knee	patient spectrum not representative of population defined in pico question. only included patients diagnosed with pji by there doctors, who subsequently underwent 2 stage revision
Two-Stage Total Knee Arthroplasty for Prosthetic Joint Infection	Cha,M.S.; Cho,S.H.; Kim,D.H.; Yoon,H.K.; Cho,H.S.; Lee,D.Y.; Lee,S.H.; Hwang,S.C.	2015	Knee Surg.Relat.Res.	Not relevant to criteria
Diagnostic work-up strategy for periprosthetic joint infections after total hip and knee arthroplasty: a 12-year experience on 320 consecutive cases	Zajonz,D.; Wuthe,L.; Tiepolt,S.; Brandmeier,P.; Prietzel,T.; von Salis-Soglio,G.F.; Roth,A.; Josten,C.; Heyde,C.E.; Ghanem,M.	2015	Patient Saf.Surg.	dosn't answer risk factor pico questions. inadequate data for diagnostic pico questions, since study is descriptive
(18)F-fluorodeoxy glucose and (18)F fluoride PET for detection of inflammation focus in periprosthetic hip joint infection cases	Choe,H.; Inaba,Y.; Kobayashi,N.; Miyamae,Y.; Ike,H.; Yukizawa,Y.; Saito,T.	2015	Mod.Rheumatol.	Less than 25 in each group
Converting between high- and low-sensitivity C-reactive protein in the assessment of periprosthetic joint infection	Milone,M.T.; Kamath,A.F.; Israelite,C.L.	2014	J.Arthroplasty	Not relevant to criteria
Diagnostic accuracy of intra-articular C-reactive protein assay in periprosthetic knee joint infection--a preliminary study	Ronde-Oustau,C.; Diesinger,Y.; Jenny,J.Y.; Antoni,M.; Gaudias,J.; Boeri,C.; Sibilia,J.; Lessinger,J.M.	2014	Orthop Traumatol.Surg.Res.	Less than 25 in each group
The 2013 Frank Stinchfield Award: Diagnosis of infection in the early postoperative period after total hip arthroplasty	Yi,P.H.; Cross,M.B.; Moric,M.; Sporer,S.M.; Berger,R.A.; Della Valle,C.J.	2014	Clin.Orthop Relat.Res.	Not relevant to criteria
Evaluation and Management of Periprosthetic Joint Infection-an International, Multicenter Study	Shanmugasundaram,S.; Ricciardi,B.F.; Briggs,T.W.; Sussmann,P.S.; Bostrom,M.P.	2014	HSS.J.	patient spectrum not representative of population defined in pico question
Painful knee prosthesis: can we help with bone SPECT/CT?	Al-Nabhani,K.; Michopoulou,S.; Allie,R.; Alkalbani,J.; Saad,Z.; Sajjan,R.; Syed,R.; Bomanji,J.	2014	Nucl.Med.Commun.	Insufficient data for 2x2 table
Evaluation of white cell count and differential in synovial fluid for diagnosing	Qu,X.; Zhai,Z.; Liu,X.; Li,H.; Wu,C.; Li,Y.; Li,H.; Zhu,Z.;	2014	PLoS One	Meta analysis

infections after total hip or knee arthroplasty	Qin,A.; Dai,K.			
Serum C-reactive protein and procalcitonin kinetics in patients undergoing elective total hip arthroplasty	Battistelli,S.; Fortina,M.; Carta,S.; Guerranti,R.; Nobile,F.; Ferrata,P.	2014	Biomed Res.Int.	not relevent. natural history study of tests levels before and after primary arthroplasty
Clinical value of optimized magnetic resonance imaging for evaluation of patients with painful hip arthroplasty	He,C.; Lu,Y.; Jiang,M.; Feng,J.; Wang,Y.; Liu,Z.	2014	Chin.Med.J.(Engl.)	Less than 25 in each group
The natural progression of synovial fluid white blood-cell counts and the percentage of polymorphonuclear cells after primary total knee arthroplasty: a multicenter study	Christensen,C.P.; Bedair,H.; Della Valle,C.J.; Parvizi,J.; Schurko,B.; Jacobs,C.A.	2013	J.Bone Joint Surg.Am.	Not relevant to criteria
Different diagnostic properties of C-reactive protein, real-time PCR, and histopathology of frozen and permanent sections in diagnosis of periprosthetic joint infection	Miyamae,Y.; Inaba,Y.; Kobayashi,N.; Choe,H.; Yukizawa,Y.; Ike,H.; Saito,T.	2013	Acta Orthop	Not relevant to criteria
Preoperative aspiration culture for preoperative diagnosis of infection in total hip or knee arthroplasty	Qu,X.; Zhai,Z.; Wu,C.; Jin,F.; Li,H.; Wang,L.; Liu,G.; Liu,X.; Wang,W.; Li,H.; Zhang,X.; Zhu,Z.; Dai,K.	2013	J.Clin.Microbiol.	Meta analysis
Assessment of interleukin-6 and other inflammatory markers in the diagnosis of Egyptian patients with periprosthetic joint infection	Abou El-Khier,N.T.; El,Ganainy Ael; Elgeidy,A.; Rakha,S.A.	2013	Egypt.J.Immunol.	duplicate publication of same data from Elgeidi 2014
Lamellated hyperintense synovitis: potential MR imaging sign of an infected knee arthroplasty	Plodkowski,A.J.; Hayter,C.L.; Miller,T.T.; Nguyen,J.T.; Potter,H.G.	2013	Radiology	Very low quality
Periprosthetic joint infection diagnosis: a complete understanding of white blood cell count and differential	Zmistowski,B.; Restrepo,C.; Huang,R.; Hozack,W.J.; Parvizi,J.	2012	J.Arthroplasty	Insufficient data for 2x2 table
Does 99mTc-MDP bone scintigraphy add to the investigation of patients with symptomatic unicompartmental knee replacement?	Wong,M.Y.; Beadsmoore,C.; Toms,A.; Smith,T.; Donell,S.	2012	Knee	patient didn't get total joint replacement. only got Unicompartmental KA

Diagnosis of periprosthetic joint infection after unicompartmental knee arthroplasty		2012	J.Arthroplasty	Not relevant to criteria
Leukocyte esterase reagent strips for the rapid diagnosis of periprosthetic joint infection	Wetters,N.G.; Berend,K.R.; Lombardi,A.V.; Morris,M.J.; Tucker,T.L.; Della Valle,C.J.	2012	J.Arthroplasty	Very low quality
Aseptic loosening of total hip arthroplasty: infection always should be ruled out	Parvizi,J.; Suh,D.H.; Jafari,S.M.; Mullan,A.; Purtill,J.J.	2011	Clin.Orthop Relat.Res.	patient population specific to aseptic revision, so patient spectrum not representative of patient population relevent to pico question
Outcome and predictors of treatment failure in early post-surgical prosthetic joint infections due to Staphylococcus aureus treated with debridement	Vilchez,F.; Martinez-Pastor,J.C.; Garcia-Ramiro,S.; Bori,G.; Macule,F.; Sierra,J.; Font,L.; Mensa,J.; Soriano,A.	2011	Clin.Microbiol.Infect.	Not relevant to criteria
Accuracy of CT-guided joint aspiration in patients with suspected infection status post-total hip arthroplasty	Tomas,X.; Bori,G.; Garcia,S.; Garcia-Diez,A.I.; Pomes,J.; Soriano,A.; Rios,J.; Almela,M.; Mensa,J.; Gallart,X.; Martinez,J.C.; Riba,J.	2011	Skeletal Radiol.	Not best available evidence
Analysis of synovial fluid in culture-negative samples of suspicious periprosthetic infections	Lee,S.C.; Jung,K.A.; Yoon,J.Y.; Nam,C.H.; Hwang,S.H.; Park,I.S.	2010	Orthopedics	Incorrect patient population (exclusive to culture-negative
Inflammatory blood laboratory levels as markers of prosthetic joint infection: a systematic review and meta-analysis	Berbari,E.; Mabry,T.; Tsaras,G.; Spangehl,M.; Erwin,P.J.; Murad,M.H.; Steckelberg,J.; Osmon,D.	2010	J.Bone Joint Surg.Am.	Systematic review
Potential clinical role of 18F FDG-PET/CT in detecting hip prosthesis infection: a study in patients undergoing two-stage revision arthroplasty with an interim spacer	Chen,S.H.; Ho,K.C.; Hsieh,P.H.; Lee,M.S.; Yen,T.C.	2010	Q.J.Nucl.Med.Mol.Imaging	Population size
Aortobifemoral bypass grafting using expanded polytetrafluoroethylene stretch grafts in patients with occlusive atherosclerotic disease	Chiesa,R.; Marone,E.M.; Tshomba,Y.; Logaldo,D.; Castellano,R.; Melissano,G.	2009	Ann.Vasc.Surg.	not relevant
The value of intraoperative Gram stain in revision total knee arthroplasty	Morgan,P.M.; Sharkey,P.; Ghanem,E.; Parvizi,J.; Clohisy,J.C.; Burnett,R.S.; Barrack,R.L.	2009	J.Bone Joint Surg.Am.	excluded from pji 2017 because gram stain test wasn't relevant to intraop pico question, but is included in the pji dx update

Inflammatory laboratory markers in periprosthetic hip fractures	Chevillotte,C.J.; Ali,M.H.; Trousdale,R.T.; Larson,D.R.; Gullerud,R.E.; Berry,D.J.	2009	J.Arthroplasty	patient spectrum not representative of population defined in pico question
The pattern of procalcitonin in primary total hip and knee arthroplasty and its implication in periprosthetic infection	Ali,S.; Christie,A.; Chapel,A.	2009	J.Clin.Med.Res.	not relevant. was a natural history study of primary arthroplasty patients
Periprosthetic infection: where do we stand with regard to Gram stain?	Ghanem,E.; Ketonis,C.; Restrepo,C.; Joshi,A.; Barrack,R.; Parvizi,J.	2009	Acta Orthop	test not relevant to pji 2017 pico question and was excluded from first guideline for being not best available evidence
The role of FDG-PET in distinguishing between septic and aseptic loosening in hip prosthesis: a review of literature	Zoccali,C.; Teori,G.; Salducca,N.	2009	Int.Orthop	Systematic review
FDG-PET for diagnosing prosthetic joint infection: systematic review and metaanalysis	Kwee,T.C.; Kwee,R.M.; Alavi,A.	2008	Eur.J.Nucl.Med.Mol.Imaging	Systematic review
Diagnosis of peri-prosthetic infection at the hip using triple-phase bone scintigraphy	Nagoya,S.; Kaya,M.; Sasaki,M.; Tateda,K.; Yamashita,T.	2008	J.Bone Joint Surg.Br.	not all patients had TJA
Normative Temporal Values of CRP and ESR in Unilateral and Staged Bilateral TKA	Park,K.K.; Kim,T.K.; Chang,C.B.; Yoon,S.W.; Park,K.U.	2008	Clin.Orthop Relat.Res.	Not relevant to criteria
Development of a molecular methodology to quantify Staphylococcus epidermidis in surgical wash-out samples from prosthetic joint replacement surgery	Byrne,F.J.; Waters,S.M.; Waters,P.S.; Curtin,W.; Kerin,M.	2007	Eur.J.Orthop Surg.Traumatol.	insufficient data for 2x2 table
Identification of orthopaedic infections using broad-range polymerase chain reaction and reverse line blot hybridization	Moojen,D.J.; Spijkers,S.N.; Schot,C.S.; Nijhof,M.W.; Vogely,H.C.; Fleer,A.; Verbout,A.J.; Castelein,R.M.; Dhert,W.J.; Schouls,L.M.	2007	J.Bone Joint Surg.Am.	not all patients would have been evaluated for PJI, since some patients had samples taken from primary arthroplasties
Role of FDG-PET and PET/CT in the diagnosis of prolonged febrile states	Jaruskova,M.; Belohlavek,O.	2006	Eur.J.Nucl.Med.Mol.Imaging	Unclear population
Post-operative unwashed shed blood transfusion does not modify the cellular immune response to surgery for total knee replacement	Munoz,M.; Cobos,A.; Campos,A.; Ariza,D.; Munoz,E.; Gomez,A.	2006	Acta Anaesthesiol.Scand.	Less than 25 in each group

The implications of 18F-FDG PET for the diagnosis of endoprosthetic loosening and infection in hip and knee arthroplasty: results from a prospective, blinded study	Delank,K.S.; Schmidt,M.; Michael,J.W.; Dietlein,M.; Schicha,H.; Eysel,P.	2006	BMC Musculoskelet.Disord.	unclear if all hip patients had total joint replacement
Outcome after pelvic sarcoma resection reconstructed with saddle prosthesis	Aljassir,F.; Beadel,G.P.; Turcotte,R.E.; Griffin,A.M.; Bell,R.S.; Wunder,J.S.; Isler,M.H.	2005	Clin.Orthop Relat.Res.	does not evaluate risk factors for PJI and didn't include hip arthroplasty patients.
The detection of aortic valve infection by FDG-PET/CT in a patient with infection following total knee replacement	Belohlavek,O.; Votrubova,J.; Skopalova,M.; Fencl,P.	2005	Eur.J.Nucl.Med.Mol.Imaging	not a study. just an imaging result of a single patient
Polymerase chain reaction can detect bacterial DNA in aseptically loose total hip arthroplasties	Clarke,M.T.; Roberts,C.P.; Lee,P.T.; Gray,J.; Keene,G.S.; Rushton,N.	2004	Clin.Orthop Relat.Res.	Not relevant to criteria
Comparison of a urine chemistry analyser and microscopy, culture and sensitivity results to detect the presence of urinary tract infections in an elective orthopaedic population	Clement,S.; Young,J.; Munday,E.	2004	Contemp Nurse.	does not look at risk factors for infection
Cementless acetabular reconstruction in revision total hip arthroplasty	Della Valle,C.J.; Berger,R.A.; Rosenberg,A.G.; Galante,J.O.	2004	Clin.Orthop Relat.Res.	does not look at risk factors for infection
Long-term results of use of a collared matte-finished femoral component fixed with second-generation cementing techniques. A fifteen-year-median follow-up study	Sanchez-Sotelo,J.; Berry,D.J.; Harmsen,S.	2002	J.Bone Joint Surg.Am.	does not evaluate risk factors for PJI
Diagnosis of infection after total hip arthroplasty	Itasaka,T.; Kawai,A.; Sato,T.; Mitani,S.; Inoue,H.	2001	J.Orthop Sci.	Less than 25 in each group
99TCm-labeled leucocyte scan for detecting infection of vascular graft involving groin	Muhammad,S.R.; Jeddy,T.A.; Chamberlain,J.	2000	J.Pak.Med.Assoc.	Not relevant to criteria
Detection of prosthetic hip infection at revision arthroplasty by immunofluorescence microscopy and PCR amplification of the bacterial 16S rRNA gene	Tunney,M.M.; Patrick,S.; Curran,M.D.; Ramage,G.; Hanna,D.; Nixon,J.R.; Gorman,S.P.; Davis,R.I.; Anderson,N.	1999	J.Clin.Microbiol.	Not relevant to criteria

Revision total knee arthroplasty using the porous-coated anatomic revision prosthesis: six- to twelve-year results	Mow,C.S.; Wiedel,J.D.	1998	J.Arthroplasty	doesn't study risk factors for pji
C-reactive protein level after total hip and total knee replacement	White,J.; Kelly,M.; Dunsmuir,R.	1998	J.Bone Joint Surg.Br.	Not relevant to criteria
Infected Total Hip Arthroplasty: Diagnosis and Treatment	Fitzgerald,R.H.,Jr.	1995	J.Am.Acad.Orthop Surg.	Commentary review
Total hip replacement in renal transplant patients	Deo,S.; Gibbons,C.L.; Emerton,M.; Simpson,A.H.	1995	J.Bone Joint Surg.Br.	retrospective case series. does not look at risk factors for pji
Diagnostic protocol in prosthetic loosening	Sudanese,A.; Toni,A.; Busanelli,L.; Furno,A.; Montina,P.P.; Marraro,M.D.; Terzi,S.; Giunti,A.	1994	Chir.Organi Mov.	unclear if all patients had tja
Long-term results of revision hip arthroplasty. Survival analysis with special reference to the femoral component	Izquierdo,R.J.; Northmore-Ball,M.D.	1994	J.Bone Joint Surg.Br.	no risk factors studied
The role of 99Tcm-HMPAO white cell imaging in suspected orthopaedic infection	Copping,C.; Dalgliesh,S.M.; Dudley,N.J.; Griffiths,P.A.; Harrington,M.; Potter,R.; Smith,B.D.	1992	Br.J.Radiol.	Not relevant to criteria
Quantitative histologic analysis of tissue growth into porous total knee components	Cook,S.D.; Barrack,R.L.; Thomas,K.A.; Haddad,R.J.,Jr.	1989	J.Arthroplasty	doesn't answer pico question
In-111-labeled leukocyte scintigraphy in suspected orthopedic prosthesis infection: comparison with other imaging modalities	Magnuson,J.E.; Brown,M.L.; Hauser,M.F.; Berquist,T.H.; Fitzgerald,R.H.,Jr.; Klee,G.G.	1988	Radiology	Patient population
The erythrocyte sedimentation rate following exchange of infected total hips	Sanzen,L.	1988	Acta Orthop Scand.	less than 25 patients
Evaluation of metallic osseous implants with nuclear medicine	Wellman,H.N.; Schauwecker,D.S.; Capello,W.N.	1988	Semin.Nucl.Med.	Narrative review
Scintigraphy with Tc, Ga and In in painful total hip prostheses	Gomez-Luzuriaga,M.A.; Galan,V.; Villar,J.M.	1988	Int.Orthop	Patient population
Indium 111-labeled white blood cell scans after vascular prosthetic reconstruction	Sedwitz,M.M.; Davies,R.J.; Pretorius,H.T.; Vasquez,T.E.	1987	J.Vasc.Surg.	not relevant
Revision total hip arthroplasty	Kavanagh,B.F.; Ilstrup,D.M.; Fitzgerald,R.H.,Jr.	1985	J.Bone Joint Surg.Am.	retrospective case series

Cementless acetabular replacement using a pegged polyethylene prosthesis	Bertin,K.C.; Freeman,M.A.; Morscher,E.; Oeri,A.; Ring,P.A.	1985	Arch.Orthop Trauma Surg.	Not relevant to criteria
99mTc-methylene diphosphonate bone imaging in the evaluation of total hip prostheses	Weiss,P.E.; Mall,J.C.; Hoffer,P.B.; Murray,W.R.; Rodrigo,J.J.; Genant,H.K.	1979	Radiology	Very low quality
Technetium 99Tcm pyrophosphate scanning in the assessment of the painful hip prosthesis	McInerney,D.P.; Hyde,I.D.	1978	Clin.Radiol.	insufficient data
Risk Stratification for Avascular Necrosis of the Femoral Head After Internal Fixation of Femoral Neck Fractures by Post-Operative Bone SPECT/CT	Han,S.; Oh,M.; Yoon,S.; Kim,J.; Kim,J.-W.; Chang,J.-S.; Ryu,J.-S.	2017	Nuclear Medicine and Molecular Imaging	does not evaluate arthroplasty patients
Positive Blood Cultures in Periprosthetic Joint Infection Decrease Rate of Treatment Success	Klement,M.R.; Siddiqi,A.; Rock,J.M.; Chen,A.F.; Bolognesi,M.P.; Seyler,T.M.	2018	J Arthroplasty	Not relevant to criteria
The Risk of Acute Infection Following Intra-articular Corticosteroid Injection Into a Pre-existing Total Knee Arthroplasty	Mills,E.S.; Elman,M.B.; Foran,J.R.H.	2018	J Arthroplasty	patients given injection after TKA
Irrigation and Debridement with Component Retention for Acute Infection After Hip Arthroplasty: Improved Results with Contemporary Management	Bryan,A.J.; Abdel,M.P.; Sanders,T.L.; Fitzgerald,S.F.; Hanssen,A.D.; Berry,D.J.	2017	J Bone Joint Surg Am	not relevant to diagnosis or prevention
Outpatient Total Knee Arthroplasty Is Associated with Higher Risk of Perioperative Complications	Arshi,A.; Leong,N.L.; D'Oro,A.; Wang,C.; Buser,Z.; Wang,J.C.; Jones,K.J.; Petrigliano,F.A.; SooHoo,N.F.	2017	J Bone Joint Surg Am	results for risk factors relevant to PICO question were not presented
Same-Day Discharge Compared with Inpatient Hospitalization Following Hip and Knee Arthroplasty	Basques,B.A.; Tetreault,M.W.; Della Valle,C.J.	2017	J Bone Joint Surg Am	only evaluates risk factors for readmission and overall reoperation
The influence of antibiotic-loaded cement spacers on the risk of reinfection after septic two-stage hip revision surgery	Staats,K.; Sevelda,F.; Kaider,A.; Bohler,C.; Sigmund,I.K.; Puchner,S.E.; Windhager,R.; Holinka,J.	2017	Infection	was a study of infection treatment and not prevention
Screening for Infection Before Revision Hip Arthroplasty: A Meta-analysis of Likelihood Ratios of Erythrocyte Sedimentation Rate and Serum C-reactive	Huerfano,E.; Bautista,M.; Huerfano,M.; Bonilla,G.; Llinas,A.	2017	J Am Acad.Orthop Surg	meta-analysis

Protein Levels				
Are Revision Hip Arthroplasty Patients at Higher Risk for Venous Thromboembolic Events Than Primary Hip Arthroplasty Patients?	Courtney,P.M.; Boniello,A.J.; Levine,B.R.; Sheth,N.P.; Paprosky,W.G.	2017	J Arthroplasty	not relevant does not look at risk factors for infection
Effect of Type 2 Diabetes on In-Hospital Postoperative Complications and Mortality After Primary Total Hip and Knee Arthroplasty	Martinez-Huedo,M.A.; Jimenez-Garcia,R.; Jimenez-Trujillo,I.; Hernandez-Barrera,V.; Del Rio,Lopez B.; Lopez-de-Andres,A.	2017	J Arthroplasty	Not relevant to criteria
The Effect of Preoperative Intra-Articular Methylprednisolone on Pain After TKA: A Randomized Double-Blinded Placebo Controlled Trial in Patients With High-Pain Knee Osteoarthritis and Sensitization	Luna,I.E.; Kehlet,H.; Jensen,C.M.; Christiansen,T.G.; Lind,T.; Stephensen,S.L.; Aasvang,E.K.	2017	J Pain	less than 25 patients
Intravenous drug abuse is a risk factor in the failure of two-stage treatment for infected total hip arthroplasty	Su,Y.J.; Lin,S.Y.; Huang,H.T.; Chang,J.K.; Chen,C.H.	2017	Kaohsiung.J Med Sci	not relevant to prevention. evaluates risk factors for infection treatment failure
Contamination risk of synovial biopsy cultures in total hip arthroplasty: a prospective review of 100 cases	Pattyn,C.; De,Bo T.; Anthonissen,J.; Willekens,P.; Claeys,G.; Audenaert,E.A.	2017	Hip.Int	Not relevant to criteria
A Multicenter Study of Irrigation and Debridement in Total Knee Arthroplasty Periprosthetic Joint Infection: Treatment Failure Is High	Urish,K.L.; Bullock,A.G.; Kreger,A.M.; Shah,N.B.; Jeong,K.; Rothenberger,S.D.	2017	J Arthroplasty	not relevant to prevention. studied risk factors for infection treatment failure
Infection risk assessment in patients undergoing primary total knee arthroplasty	Poultsides,L.A.; Triantafyllopoulos,G.K.; Sakellariou,V.I.; Memtsoudis,S.G.; Sculco,T.P.	2017	Int Orthop	of the risk factors reported for deep pji, none were relevant to pico question
Risk of Periprosthetic Joint Infection in Patients With Multiple Arthroplasties	Abblitt,W.P.; Chan,E.W.; Shinar,A.A.	2017	J Arthroplasty	not specific to hip and knee patients
VASO (Vitamin D and Arthroplasty Surgery Outcomes) study - supplementation of vitamin D deficiency to improve outcomes after total hip or knee replacement: study	Morrison,R.J.M.; Bunn,D.; Gray,W.K.; Baker,P.N.; White,C.; Rangan,A.; Rankin,K.S.; Reed,M.R.	2017	Trials	Not relevant to criteria

protocol for a randomised controlled feasibility trial				
Two stage revision hip arthroplasty in periprosthetic joint infection. Comparison study: with or without the use of a spacer	Marczak,D.; Synder,M.; Sibinski,M.; Polguj,M.; Dudka,J.; Kowalczewski,J.	2017	Int Orthop	not relevant. patients already had joint infection at start of the study
Retained Antibiotic Spacers After Total Hip and Knee Arthroplasty Resections: High Complication Rates	Petis,S.M.; Perry,K.I.; Pagnano,M.W.; Berry,D.J.; Hanssen,A.D.; Abdel,M.P.	2017	J Arthroplasty	Not relevant to criteria
Cementless Total Knee Arthroplasty in Patients Older Than 75 Years	Newman,J.M.; Khlopas,A.; Chughtai,M.; Gwam,C.U.; Mistry,J.B.; Yakubek,G.A.; Harwin,S.F.; Mont,M.A.	2017	J Knee.Surg	Not relevant to criteria
Risk factors and outcomes for nosocomial infection after prosthetic vascular grafts	Farinas,M.C.; Campo,A.; Duran,R.; Sarralde,J.A.; Nistal,J.F.; Gutierrez-Diez,J.F.; Farinas-Alvarez,C.	2017	J Vasc Surg	Patient population, patients underwent PVG of the abdominal aorta
Vancomycin Povidone-Iodine Protocol Improves Survivorship of Periprosthetic Joint Infection Treated With Irrigation and Debridement	Riesgo,A.M.; Park,B.K.; Herrero,C.P.; Yu,S.; Schwarzkopf,R.; Iorio,R.	2017	J Arthroplasty	patient population did not get TJA, but rather got irrigation and debridement with modular component and liner exchange for treatment of PJI
The Kidney, Liver, Index surgery and C reactive protein score is a predictor of treatment response in acute prosthetic joint infection	Jimenez-Garrido,C.; Gomez-Palomo,J.M.; Rodriguez-Delourme,I.; Duran-Garrido,F.J.; Nuno-Alvarez,E.; Montanez-Heredia,E.	2017	Int Orthop	not relevant to infection prevention. studies factors predicted success of treatment of PJI
Suppressive antibiotic therapy with oral tetracyclines for prosthetic joint infections: a retrospective study of 78 patients	Pradier,M.; Robineau,O.; Boucher,A.; Titecat,M.; Blondiaux,N.; Valette,M.; Loiez,C.; Beltrand,E.; Nguyen,S.; Dezeque,H.; Migaud,H.; Senneville,E.	2017	Infection	not relevant to prevention. studied antibiotics for treatment of PJI
Rivaroxaban and early periprostethic joint infection: our experience	Di,Benedetto P.; Zangari,A.; De,Franceschi D.; Di Benedetto,E.D.; Cainero,V.; Beltrame,A.; Gisonni,R.; Causero,A.	2017	Acta Biomed	doesn't answer pico question

Comparison of the efficacy of static versus articular spacers in two-stage revision surgery for the treatment of infection following total knee arthroplasty: a meta-analysis	Ding,H.; Yao,J.; Chang,W.; Liu,F.	2017	J Orthop Surg Res	Systematic review
Obesity Is Independently Associated With Early Aseptic Loosening in Primary Total Hip Arthroplasty	Goodnough,L.H.; Finlay,A.K.; Huddleston,J.I.,III; Goodman,S.B.; Maloney,W.J.; Amanatullah,D.F.	2017	J Arthroplasty	Not relevant to criteria
Value of antibiotic prophylaxis in routine knee arthroscopy : A retrospective study	Qi,Y.; Yang,X.; Pan,Z.; Wang,H.; Chen,L.	2017	Orthopade.	not an arthroplasty study.
Association Between Body Mass Index and Thirty-Day Complications After Total Knee Arthroplasty	George,J.; Piuzzi,N.S.; Ng,M.; Sodhi,N.; Khlopas,A.A.; Mont,M.A.	2017	J Arthroplasty	Population size
Temporal trends and epidemiology of Staphylococcus aureus surgical site infection in the Swiss surveillance network: a cohort study	Abbas,M.; Aghayev,E.; Troillet,N.; Eisenring,M.C.; Kuster,S.P.; Widmer,A.F.; Harbarth,S.	2017	J Hosp.Infect.	not specific to hip and knee patients
Systemic Absorption of Antibiotics From Antibiotic-Loaded Cement Spacers for the Treatment of Periprosthetic Joint Infection	Edelstein,A.I.; Okroj,K.T.; Rogers,T.; Della Valle,C.J.; Sporer,S.M.	2017	J Arthroplasty	Population size
Efficacy of perineural dexamethasone with ropivacaine in adductor canal block for post-operative analgesia in patients undergoing total knee arthroplasty: A randomized controlled trial	Wang,C.J.; Long,F.Y.; Yang,L.Q.; Shen,Y.J.; Guo,F.; Huang,T.F.; Gao,J.	2017	Exp.Ther Med	steroid not given intraarticularly
Antibiotic therapy duration for prosthetic joint infections treated by Debridement and Implant Retention (DAIR): Similar long-term remission for 6 weeks as compared to 12 weeks	Chaussade,H.; Uckay,I.; Vuagnat,A.; Druon,J.; Gras,G.; Rosset,P.; Lipsky,B.A.; Bernard,L.	2017	Int J Infect.Dis	not relevant to prevention and patients didnot get antibiotics prior to joint replacement. patients recieved DAIR for infection treatment
Acute Kidney Injury After First-Stage Joint Revision for Infection: Risk Factors and the Impact of Antibiotic Dosing	Geller,J.A.; Cunn,G.; Herschmiller,T.; Murtaugh,T.; Chen,A.	2017	J Arthroplasty	not relevant to prevention because they studied risk factors for acute kidney injury after the first stage of 2 stage revision
Up to seven years' follow-up of short cemented stems in complex primary total knee arthroplasty: A prospective study	Angers-Goulet,M.; Bedard,M.	2017	Knee.	Not relevant to criteria

Using a non-invasive secure skin closure following total knee arthroplasty leads to fewer wound complications and no patient home care visits compared to surgical staples	Carli,A.V.; Spiro,S.; Barlow,B.T.; Haas,S.B.	2017	Knee.	Not relevant to criteria
Success rates, characteristics, and costs of articulating antibiotic spacers for total knee periprosthetic joint infection	Nodzo,S.R.; Boyle,K.K.; Spiro,S.; Nocon,A.A.; Miller,A.O.; Westrich,G.H.	2017	Knee.	not relevant. patients already had joint infection at start of the study
Body mass index as a predictor of outcome in total knee replace: A systemic review and meta-analysis	Sun,K.; Li,H.	2017	Knee.	Systematic review
Are There Benefits In Early Diagnosis Of Prosthetic Joint Infection With Multiplex Polymerase Chain Reaction?	Lausmann,C.; Zahar,A.; Citak,M.; Branes,J.; Schmidl,S.; Frommelt,L.; Gehrke,T.; Gebauer,M.	2017	J Bone Jt.Infect.	patient population not representative of full spectrum from pico question
Fluoroscopy- vs ultrasound-guided aspiration techniques in the management of periprosthetic joint infection: which is the best?	Randelli,F.; Brioschi,M.; Randelli,P.; Ambrogi,F.; Sdao,S.; Aliprandi,A.	2017	Radiol Med	Very low quality
Patterns of bone tracer uptake on SPECT-CT in symptomatic and asymptomatic patients with primary total hip arthroplasty	Schweizer,T.; Schiapparelli,F.F.; Rotigliano,N.; Rasch,H.; Amsler,F.; Hirschmann,M.T.	2017	Eur J Nucl.Med Mol.Imaging	Not relevant to criteria
Bone and subcutaneous adipose tissue pharmacokinetics of vancomycin in total knee replacement patients	Bue,M.; Tottrup,M.; Hanberg,P.; Langhoff,O.; Birke-Sorensen,H.; Thillemann,T.M.; Andersson,T.L.; Soballe,K.	2017	Acta Orthop	no patient oriented outcomes. was pharmacokinetic study
Serum D-Dimer Test Is Promising for the Diagnosis of Periprosthetic Joint Infection and Timing of Reimplantation	Shahi,A.; Kheir,M.M.; Tarabichi,M.; Hosseinzadeh,H.R.S.; Tan,T.L.; Parvizi,J.	2017	J Bone Joint Surg Am	patient population includes primary arthroplasties
Risk Factors for Repeat Debridement, Spacer Retention, Amputation, Arthrodesis, and Mortality After Removal of an Infected Total Knee Arthroplasty With Spacer Placement	Cancienne,J.M.; Granadillo,V.A.; Patel,K.J.; Werner,B.C.; Browne,J.A.	2017	J Arthroplasty	Not relevant to criteria

Excellent AUC for joint fluid cytology in the detection/exclusion of hip and knee prosthetic joint infection	Gallo,J.; Juranova,J.; Svoboda,M.; Zapletalova,J.	2017	Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub	Not relevant to criteria
Periprosthetic Joint Infection Is the Main Cause of Failure for Modern Knee Arthroplasty: An Analysis of 11,134 Knees	Koh,C.K.; Zeng,I.; Ravi,S.; Zhu,M.; Vince,K.G.; Young,S.W.	2017	Clin Orthop Relat.Res	not relevant does not look at risk factors for infection
Suppressive antibiotic therapy with oral doxycycline for Staphylococcus aureus prosthetic joint infection: a retrospective study of 39 patients	Pradier,M.; Nguyen,S.; Robineau,O.; Titecat,M.; Blondiaux,N.; Valette,M.; Loiez,C.; Beltrand,E.; Dezeque,H.; Migaud,H.; Senneville,E.	2017	Int J Antimicrob.Agents.	not relevant to prevention because patients were being treated for infection, some of which were treated with DAIR instead of revision arthroplasty
Interpretation of Leukocyte Esterase for the Detection of Periprosthetic Joint Infection Based on Serologic Markers	Tarabichi,M.; Fleischman,A.N.; Shahi,A.; Tian,S.; Parvizi,J.	2017	J Arthroplasty	the spectrum of patients is not representative of the population in which the test would be used in practice
Withholding Preoperative Antibiotic Prophylaxis in Knee Prosthesis Revision: A Retrospective Analysis on Culture Results and Risk of Infection	Wouthuyzen-Bakker,M.; Tornero,E.; Claret,G.; Bosch,J.; Martinez-Pastor,J.C.; Combalia,A.; Soriano,A.	2017	J Arthroplasty	for antibiotic choice and timing, not all patients got TJA, since some only had partial revision.
Discharge to Inpatient Facilities After Total Hip Arthroplasty Is Associated With Increased Postdischarge Morbidity	Fu,M.C.; Samuel,A.M.; Sculco,P.K.; MacLean,C.H.; Padgett,D.E.; McLawhorn,A.S.	2017	J Arthroplasty	Not relevant to criteria
Common Medical Comorbidities Correlated With Poor Outcomes in Hip Periprosthetic Infection	Cunningham,D.J.; Kavolus,J.J.; Bolognesi,M.P.; Wellman,S.S.; Seyler,T.M.	2017	J Arthroplasty	not relevant to prevention, because they studied risk factors for treatment failure among patients who already had infection
Human Immunodeficiency Virus Infection and Hip and Knee Arthroplasty	Dimitriou,D.; Ramokgopa,M.; Pietrzak,J.R.T.; van der Jagt,D.; Mokete,L.	2017	JBJS Rev	Meta analysis
Preemptive analgesia by using celecoxib combined with tramadol/APAP alleviates post-operative pain of patients undergoing total knee arthroplasty	Xu,Z.; Zhang,H.; Luo,J.; Zhou,A.; Zhang,J.	2017	Phys.Sportsmed.	treatments were not antibiotics
Effect of Intravenous Corticosteroids on Pain Management and Early Rehabilitation in Patients Undergoing Total Knee or Hip Arthroplasty: A Meta-Analysis of Randomized Controlled Trials	Li,D.; Wang,C.; Yang,Z.; Kang,P.	2017	Pain Pract	Meta analysis

Type 2 diabetes and in-hospital complications after revision of total hip and knee arthroplasty	Lopez-de-Andres,A.; Hernandez-Barrera,V.; Martinez-Huedo,M.A.; Villanueva-Martinez,M.; Jimenez-Trujillo,I.; Jimenez-Garcia,R.	2017	PLoS One	Commentary review
Comparison of postoperative complications after total hip arthroplasty among patients receiving aspirin, enoxaparin, warfarin, and factor Xa inhibitors	Agaba,P.; Kildow,B.J.; Dhotar,H.; Seyler,T.M.; Bolognesi,M.	2017	J Orthop	anticoagulation state was after surgery
C-reactive protein course during the first 5 days after total knee arthroplasty cannot predict early prosthetic joint infection	Windisch,C.; Brodt,S.; Roehner,E.; Matziolis,G.	2017	Arch Orthop Trauma Surg	insufficient 2x2 table
Single-stage Acetabular Revision During Two-stage THA Revision for Infection is Effective in Selected Patients	Fink,B.; Schlumberger,M.; Oremek,D.	2017	Clin Orthop Relat.Res	did not include all uninfected joint replacements
Removal of an Infected Total Hip Arthroplasty: Risk Factors for Repeat Debridement, Long-term Spacer Retention, and Mortality	Cancienne,J.M.; Werner,B.C.; Bolarinwa,S.A.; Browne,J.A.	2017	J Arthroplasty	was a study of factors related to treatment success of infection
The Influence of a Failed Irrigation and Debridement on the Outcomes of a Subsequent 2-Stage Revision Knee Arthroplasty	Nodzo,S.R.; Boyle,K.K.; Nocon,A.A.; Henry,M.W.; Mayman,D.J.; Westrich,G.H.	2017	J Arthroplasty	not relevant was a study of treatment of infection instead of prevention
Epidemiology and Antibiotic Resistance of Late Prosthetic Knee and Hip Infections	Drago,L.; De,Vecchi E.; Bortolin,M.; Zagra,L.; Romano,C.L.; Cappelletti,L.	2017	J Arthroplasty	not relevant to antibiotic prophylaxis pico question. studied antibiotic succeptibility of sample taken from patients with PJI
Effect of an anaesthetic screening drape on vertical laminar airflow	Sehjal,R.; Bakti,N.; Goddard,R.	2017	J Hosp.Infect.	Not relevant to criteria
Primary hip and knee arthroplasty in a temporary operating theatre is associated with a significant increase in deep periprosthetic infection	Bloch,B.V.; Shah,A.; Snape,S.E.; Boswell,T.C.J.; James,P.J.	2017	Bone Joint J	no risk factors relevant to pico question
In search of the optimal wound dressing material following total hip and knee arthroplasty: a systematic review and meta-analysis	Sharma,G.; Lee,S.W.; Atanacio,O.; Parvizi,J.; Kim,T.K.	2017	Int Orthop	Meta analysis

Mid-term Results of Total Hip and Total Knee Arthroplasty in Patients With Human Immunodeficiency Virus	Chalmers,B.P.; Abdel,M.P.; Taunton,M.J.; Trousdale,R.T.; Pagnano,M.W.	2017	Orthopedics	Population size
Inadequacy of Joint Aspiration for Detection of Persistent Periprosthetic Infection During Two-Stage Septic Revision Knee Surgery	Preininger,B.; Janz,V.; von,Roth P.; Trampuz,A.; Perka,C.F.; Pfitzner,T.	2017	Orthopedics	evaluated test in cohort in which infected implant had already been removed
Peri-Prosthetic Knee Infection Management: Spacers Loaded with Two or Three Antibiotic Agents	Ortola,D.J.; Fenga,D.; Marcellino,S.; Rosi,M.; Centofanti,F.; Rosa,M.A.	2017	Surg Infect.(Larchmt.)	not relevant. patients already had joint infection at start of the study
The efficacy and safety of two low-dose peri-operative dexamethasone on pain and recovery following total hip arthroplasty: a randomized controlled trial	Lei,Y.T.; Xu,B.; Xie,X.W.; Xie,J.W.; Huang,Q.; Pei,F.X.	2017	Int Orthop	injections not given steroid injections intra articularly
The risk factors of failed reimplantation arthroplasty for periprosthetic hip infection	Jhan,S.W.; Lu,Y.D.; Lee,M.S.; Lee,C.H.; Wang,J.W.; Kuo,F.C.	2017	BMC Musculoskelet.Disord	was a study of infection treatment failure, rather than prevention
Low sensitivity of implant sonication when screening for infection in revision surgery	Van Diek,F.M.; Albers,C.G.M.; Van Hooff,M.L.; Meis,J.F.; Goosen,J.H.M.	2017	Acta Orthop	not specific to hip and knee patients
Distribution characteristics of Staphylococcus spp. in different phases of periprosthetic joint infection: A review	Guo,G.; Wang,J.; You,Y.; Tan,J.; Shen,H.	2017	Exp.Ther Med	Systematic review
Can intravenous steroid administration reduce postoperative pain scores following total knee arthroplasty?: A meta-analysis	Xing,L.Z.; Li,L.; Zhang,L.J.	2017	Medicine (Baltimore.)	Meta analysis
Predicting lower limb periprosthetic joint infections: A review of risk factors and their classification	George,D.A.; Drago,L.; Scarponi,S.; Gallazzi,E.; Haddad,F.S.; Romano,C.L.	2017	World J Orthop	Systematic review
Implant Survival After Minimally Invasive Anterior or Anterolateral Vs. Conventional Posterior or Direct Lateral Approach: An Analysis of 21,860 Total Hip Arthroplasties from the Norwegian Arthroplasty Register (2008 to 2013)	Mjaaland,K.E.; Svenningsen,S.; Fenstad,A.M.; Havelin,L.I.; Furnes,O.; Nordsletten,L.	2017	J Bone Joint Surg Am	no relevant risk factors to pico question
Clinical Outcome Evaluation of Primary Total Knee Arthroplasty in Patients with	Liu,P.; Liu,J.; Xia,K.; Chen,L.; Wu,X.	2017	Med Sci Monit	Not relevant to criteria

Diabetes Mellitus				
Two doses of low-dose perioperative dexamethasone improve the clinical outcome after total knee arthroplasty: a randomized controlled study	Xu,B.; Ma,J.; Huang,Q.; Huang,Z.Y.; Zhang,S.Y.; Pei,F.X.	2017	Knee.Surg Sports Traumatol Arthrosc.	steroid injections were not intra articular
Clindamycin-rifampin combination therapy for staphylococcal periprosthetic joint infections: a retrospective observational study	Leijtens,B.; Elbers,J.B.W.; Sturm,P.D.; Kullberg,B.J.; Schreurs,B.W.	2017	BMC Infect.Dis	not relevant to prevention. evaluated infection treatment
Health-related quality of life with long-term retention of the PROSthesis of Antibiotic Loaded Acrylic Cement system following infection resolution in low demand patients	Beaupre,L.A.; Stampe,K.; Masson,E.; O'Connor,G.; Clark,M.; Joffe,A.M.; Boychuk,L.R.; Lavoie,G.	2017	J Orthop Surg (Hong Kong.)	was a study of infection treatment, and not infection prevention
Risk factors for amputation in periprosthetic knee infection	Polanco-Armenta,A.G.; Miguel-Perez,A.; Rivera-Villa,A.H.; Barrera-Garcia,M.I.; Sanchez-Prado,M.G.; Vazquez-Noya,A.; Vidal-Cervantes,F.; de,Jesus Guerra-Jasso; Perez-Atanasio,J.M.	2017	Eur J Orthop Surg Traumatol	patient population only includes patients who already have infection, and the outcome is amputation in this group of patients, so study would be more relevant for treatment cpg, and risk factors for treatment failure
The management of open tibial fractures in children: a retrospective case series of eight years' experience of 61 cases at a paediatric specialist centre	Nandra,R.S.; Wu,F.; Gaffey,A.; Bache,C.E.	2017	Bone Joint J	not specific to hip and knee arthroplasty patients
Diagnostic accuracy of arthroscopic biopsy in periprosthetic infections of the hip	Pohlig,F.; Muhlhofer,H.M.; Lenze,U.; Lenze,F.W.; Suren,C.; Harrasser,N.; von Eisenhart-Rothe,R.; Schauwecker,J.	2017	Eur J Med Res	Population size
Debridement and implant retention in the management of hip periprosthetic joint infection: outcomes following guided and rapid treatment at a single centre	Sendi,P.; Lotscher,P.O.; Kessler,B.; Graber,P.; Zimmerli,W.; Clauss,M.	2017	Bone Joint J	not a diagnostic study
Acute Delayed or Late Infection of Revision Total Hip Arthroplasty Treated with Debridement/Antibiotic-loaded	Chang,J.D.; Kim,I.S.; Lee,S.S.; Yoo,J.H.	2017	Hip.Pelvis.	less than 25 patients and not relevant to prevention because article studied treatment of infected patients

Cement Beads and Retention of the Prosthesis				
ESR and CRP are useful between stages of 2-stage revision for periprosthetic joint infection	Lindsay,C.P.; Olcott,C.W.; Del Gaizo,D.J.	2017	Arthroplast.Today.	Patient population
Added value of 18F-FDG PET/CT in diagnosing infected hip prosthesis	Kwee,R.M.; Broos,W.A.; Brans,B.; Walenkamp,G.H.; Geurts,J.; Weijers,R.E.	2017	Acta Radiol	Very low quality
Use of Common Inflammatory Markers in the Long-Term Screening of Total Hip Arthroprosthesis Infections: Our Experience	Falzarano,G.; Piscopo,A.; Grubor,P.; Rollo,G.; Medici,A.; Pipola,V.; Bisaccia,M.; Caraffa,A.; Barron,E.M.; Nobile,F.; Cioffi,R.; Meccariello,L.	2017	Adv Orthop	Insufficient data for 2x2 table
Microbiological diagnosis in revision of infected knee arthroplasties in Denmark	Lindberg-Larsen,M.; Pitter,F.T.; Voldstedlund,M.; Schroder,H.M.; Bagger,J.	2017	Infect.Dis (Lond.)	Not relevant to criteria
Antibiotic prophylaxis adequacy in knee arthroplasty and surgical wound infection: Prospective cohort study	Del-Moral-Luque,J.A.; Checa-Garcia,A.; Lopez-Hualda,A.; Villar-Del-Campo,M.C.; Martinez-Martin,J.; Moreno-Coronas,F.J.; Montejo-Sancho,J.; Rodriguez-Caravaca,G.	2017	Rev Esp Cir Ortop.Traumatol	does not compare efficacy of antibiotics
Does an Antibiotic-Loaded Hydrogel Coating Reduce Early Post-Surgical Infection After Joint Arthroplasty?	Romano,C.L.; Malizos,K.; Capuano,N.; Mezzoprete,R.; D'Arienzo,M.; Van der Straeten,C.; Scarponi,S.; Drago,L.	2016	J Bone Jt.Infect.	Not relevant to criteria
Pseudomonas Prosthetic Joint Infections: A Review of 102 Episodes	Shah,N.B.; Osmon,D.R.; Steckelberg,J.M.; Sierra,R.J.; Walker,R.C.; Tande,A.J.; Berbari,E.F.	2016	J Bone Jt.Infect.	not relevant to prevention. looks at risk factors for infection treatment failure
Risk of Surgical Site Infection in Elective Hip and Knee Replacements After Confirmed Eradication of MRSA in Chronic Carriers	Tandon,T.; Tadros,B.J.; Akehurst,H.; Avasthi,A.; Hill,R.; Rao,M.	2017	Journal of Arthroplasty	not relevant comparison group to assess the treatment comparison in the pico question

Antibiotic-loaded Bone Cement as Prophylaxis in Total Joint Replacement	MartÃ?Ânez-Moreno,J.; Merino,V.; NÃ?Â¡cher,A.; Rodrigo,J.L.; Climente,M.; Merino-SanjuÃ?Â¡n,M.	2017	Orthopaedic surgery	systematic reivew
Same-Hospital Re-Admission Rate Is Not Reliable for Measuring Post-Operative Infection-Related Re-Admission	Rattan,R.; Parreco,J.; Zakrison,T.L.; Yeh,D.D.; Lieberman,H.M.; Namias,N.	2017	Surgical Infections	risk factor analysis not specific to hip and knee arthroplasty
Role of Nuclear Medicine for Diagnosing Infection of Recently Implanted Lower Extremity Arthroplasties	Palestro,C.J.; Love,C.	2017	Seminars in Nuclear Medicine	Narrative review
Reduced survival for uncemented compared to cemented total hip arthroplasty after operatively treated acetabular fractures	Clarke-Jenssen,J.; Westberg,M.; RÃ?Â¸ise,O.; Storeggen,S.A.Ã?; Bere,T.; Silberg,I.; Madsen,J.E.	2017	Injury	does not look at risk factors for pji
A positive bacterial culture during reimplantation is associated with a poor outcome in two-stage exchange arthroplasty for deep infection	AkgÃ?Â¼n,D.; MÃ?Â¼ller,M.; Perka,C.; Winkler,T.	2017	Bone and Joint Journal	Not relevant to criteria, insufficient 2x2 table
Smoking is associated with earlier time to revision of total knee arthroplasty	Lim,C.T.; Goodman,S.B.; Huddleston,J.I.; Harris,A.H.S.; Bhowmick,S.; Maloney,W.J.; Amanatullah,D.F.	2017	Knee	Not relevant to criteria
Safety aspects of preoperative high-dose glucocorticoid in primary total knee replacement	JÃ?Â¸rgensen,C.C.; Pitter,F.T.; Kehlet,H.	2017	British Journal of Anaesthesia	unclear if steroids given intraarticularly
Weight Gain After Primary Total Knee Arthroplasty Is Associated With Accelerated Time to Revision for Aseptic Loosening	Lim,C.T.; Goodman,S.B.; Huddleston,J.I.; Harris,A.H.S.; Bhowmick,S.; Maloney,W.J.; Amanatullah,D.F.	2017	Journal of Arthroplasty	insufficient data to answer pico question. cannot be used to evaluate if weight change increases or decreases risk of revision for infection because there is not a no infection revision group
C-reactive protein may misdiagnose prosthetic joint infections, particularly chronic and low-grade infections	PÃ?Â©rez-Prieto,D.; Portillo,M.E.; Puig-VerdiÃ?Â©,L.; Alier,A.; MartÃ?Ânez,S.; SorlÃ?Â,L.; Horcajada,J.P.; Monllau,J.C.	2017	International Orthopaedics	Insufficient data for 2x2 table
Unplanned readmissions after primary total knee arthroplasty in Korean patients: Rate, causes, and risk factors	Lee,S.W.; Kumar,GN K.; Kim,T.K.	2017	Knee	not relevant does not look at risk factors for infection

Perioperative systemic glucocorticoids in total hip and knee arthroplasty: A systematic review of outcomes	Hartman,J.; Khanna,V.; Habib,A.; Farrokhyar,F.; Memon,M.; Adili,A.	2017	Journal of Orthopaedics	Systematic review
Peri-operative care considerations for primary total knee arthroplasty in the obese patient	Romero,J.A.; Jones,R.; Brown,T.S.	2017	Seminars in Arthroplasty	literature review
Complications Following Outpatient Total Joint Arthroplasty: An Analysis of a National Database	Courtney,P.M.; Boniello,A.J.; Berger,R.A.	2017	Journal of Arthroplasty	does not look at risk factors for pji
Alteration of inflammatory cytokine production in primary total knee arthroplasty using antibiotic-loaded bone cement	Wilairatana,V.; Sinlapavilawan,P.; Honsawek,S.; Limpaphayom,N.	2017	Journal of Orthopaedics and Traumatology	less than 25 patients per group
Efficacy and safety of non-pharmacological and non-biological pharmacological treatment: A systematic literature review informing the 2016 update of the ASAS/EULAR recommendations for the management of axial spondyloarthritis	Regel,A.; Sepriano,A.; Baraliakos,X.; Van Der Heijde,D.; Braun,J.; LandewÃ?Â©,R.; Van Den Bosch,F.; Falzon,L.; Ramiro,S.	2017	RMD Open	systematic reivew
The American College of Surgeons National Surgical Quality Improvement Program Surgical Risk Calculator Has a Role in Predicting Discharge to Post-Acute Care in Total Joint Arthroplasty	Goltz,D.E.; Baumgartner,B.T.; Politzer,C.S.; DiLallo,M.; Bolognesi,M.P.; Seyler,T.M.	2017	Journal of Arthroplasty	Not relevant to criteria
The value of detecting serum PCT and IL-6 levels during the perioperative period of primary hip and knee arthroplasty	Zhang,L.; Cai,D.; Guo,H.	2017	Biomedical Research	studied only superficial infection
Visible glove perforation in total knee arthroplasty: Risk and consequences	Jid,L.Q.; Ping,M.W.; Chung,W.Y.; Leung,W.Y.	2017	Journal of orthopaedic surgery	Not relevant to criteria. for risk factor pico, evaluated risk factor not relevant to pico question
Synovial calprotectin	Wouthuyzen,Bakker M.; Ploegmakers,J.J.W.; Kampinga,G.A.; Wagenmakers,Huizenga L.; Jutte,P.C.; Muller-Kobold,A.C.	2017	Bone and Joint Journal	not specific to hip and knee patients
Detection of occult infection following total joint arthroplasty using sequential technetium-99m HDP bone scintigraphy	Johnson, J. A.; Christie, M. J.; Sandler, M. P.; Parks, P. F., Jr.; Homra, L.; Kaye, J. J.	1988	J Nucl Med	not specific to hip and knee tja. includes unicompartmental knee, hip hemiarthroplasties, and a shoulder

and indium-111 WBC imaging				arthroplasty
Differential bone-scanning in the evaluation of a painful total joint replacement	Reing, C. M.; Richin, P. F.; Kenmore, P. I.	1979	J Bone Joint Surg Am	not all patients had hip and knee TJA. elbow also included