Resident Assembly

Open Forum
Advisory Opinions

Wednesday, March 13, 2019
10:00 - 11:00 a.m. Pacific

Venetian/Sands Expo
Room 904-906
Las Vegas, NV
PROCESS FOR HANDLING
PROPOSED RESIDENT ASSEMBLY ADVISORY
OPINIONS

AAOS Resident Assembly

Open Hearing

The Resident Assembly Chair moderates.

The Sponsors of the proposed Advisory Opinions should be prepared to make the first remarks and address questions.

Report Drafting

Anyone with a particularly strong interest in the outcome of the statement or wishing to be heard beyond the Open Hearing is strongly encouraged to attend the executive sessions of the Resident Assembly Executive Committee.

AAOS staff will duplicate copies of the Resident Assembly reports for distribution on Thursday.

AAOS Resident Assembly Meeting

The Resident Assembly Chair will oversee the Advisory Opinions during the meeting. Staff will assist the Chair in determining parliamentary questions.

There is up to 30 minutes allotted for consideration of the items before the Resident Assembly – and that the following guidelines will be followed:

- There will be three microphones -- labeled #1, #2, and #3;

- After the recommendation on the proposed action is made by the Chair, the primary sponsor of the statement (if any) will be asked to concisely provide his or her view on the recommendation;

- All speakers should identify themselves, whether they are a resident or delegate, and if a delegate which program they are from, whether they are speaking on behalf of the program or themselves and whether they are speaking in favor of or against the issue on the floor;

- Speakers should be concise;
- Speakers should attempt to limit their discussion to items that have not yet been raised; and
- Speakers should not speak again until others have had the opportunity to do so.

**Presentation of Report and Recommendations**

The Chair will present the report and recommendation on each action and move its adoption. No second is necessary. The discussion should focus on the report and recommendation – and speakers should be prompted to indicate whether they are for or against it.

If an amendment is made, the person presenting the amendment should identify whether they are a resident or delegate, and if a delegate which program they are from and whether they are speaking on behalf of the program or themselves. Discussion should then shift entirely to the amendment and whether it should be adopted. Members of the Resident Assembly may speak to the amendment, regardless of who initially presented the amendment.

Once all amendments have been made, the Resident Assembly will vote on the Advisory Opinion as it has been amended by that body. Resident delegates will have one vote. For all matters coming before the 2019 Annual Meeting, voters will select from among three options:

- Accept the recommendation
- Do not accept the recommendation
- Take no position (abstain)

A majority of those delegates present will vote on the recommended Advisory Opinion, with the voting results to be announced prior to the conclusion of the Resident Assembly.

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If there are any questions regarding these Procedures, please contact residentassembly@aaos.org
<table>
<thead>
<tr>
<th>DATE &amp; PLACE INTRODUCED</th>
<th>STATEMENT NUMBER</th>
<th>TITLE (as revised by the RA)</th>
<th>RA Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 2019 Las Vegas, NV</td>
<td></td>
<td>Rules and Procedures</td>
<td>TBD</td>
</tr>
<tr>
<td>RA Advisory Opinion #1</td>
<td>Fellowship Information Standardization through a Searchable Database</td>
<td>TBD</td>
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</tr>
<tr>
<td>RA Advisory Opinion #2</td>
<td>Propose Legislative Action to Allow for Physician Extender Reimbursement when both Resident Physicians and Physician Extenders are Assisting in Operations.</td>
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<tr>
<td>RA Advisory Opinion #3</td>
<td>Proposal to develop a Global Health Committee</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>
AAOS Resident Assembly Rules: Edited
Resident Assembly

Rules and Procedures
TABLE OF CONTENTS

Article I: Resident Assembly
Article II: Membership of the Resident Assembly
Article III: Resident Assembly Standing Committees
Article IV: Resident Assembly Subject Matter Committees
Article V: Resident Assembly Officers
Article VI: Resident Assembly at the Annual Meeting
Article VIII: Parliamentary Authority Article

Article VII: Amendments
At the 2012 Annual Meeting of the American Academy of Orthopaedic Surgeons (AAOS), an assembly of orthopaedic residents in attendance recommended the creation of a Resident Assembly within the AAOS. The Resident Assembly is an advisory body to the AAOS on issues of importance to orthopaedic residents. In addition, the Resident Assembly is designed as a forum to allow orthopaedic residents to embrace their roles as patient advocates and life-long learners.

Article I: Resident Assembly

A. Name

1. There shall be an AAOS Resident Assembly ("Resident Assembly"). The Resident Assembly shall represent all orthopaedic surgery residents who are pursuing ABOS, AOBOS and Royal College of Physicians and Surgeons of Canada certification in the United States and Canada.

2. The Resident Assembly shall have elected officers and leadership committees.

3. The Resident Assembly shall report to and coordinate with the AAOS Emerging Professionals Committee, AAOS Membership and Leader Development Committee.

B. Purpose

The purpose of the Resident Assembly shall be to:

1. Serve as a representative, deliberative, and advisory body to the AAOS regarding matters of concern to orthopaedic residents and fellows in training;

2. Provide an advisory voice for orthopaedic residents and fellows in training within the AAOS and assist the decision-making bodies of the AAOS with topics pertaining to orthopaedic residents and fellows in training and education;

3. Enhance and maintain communications between the AAOS and orthopaedic residents and fellows in training; facilitate communication and the dissemination of AAOS policy within individual orthopaedic residency and fellowship programs;

4. Encourage increased opportunities for involvement and participation by orthopaedic residents and fellows in training in AAOS educational and research affairs;

4.5. Advance the AAOS strategic plan and initiatives; and and

5.6. Consider and make recommendations regarding the AAOS issues as requested.

In each of the above activities, the Resident Assembly will foster greater orthopaedic resident and fellows in training involvement in the AAOS in the anticipation that this engagement will persist beyond the residency and fellowship training years.

C. Duties

The duties of the Resident Assembly shall be to:
1. Assist in the execution and implementation of AAOS initiatives;
2. Serve as a conduit for AAOS to provide information and resources to members and residency and fellowship programs and their trainees information and resources;
3. Identify and communicate issues and concerns of orthopaedic residents to the AAOS;
4. Develop recommendations on AAOS policies, activities and programs upon request;
5. Facilitate orthopaedic resident and fellows in training involvement within the AAOS;
6. Develop Resident Assembly Advisory Opinions to be submitted to the AAOS Candidate, Resident and Fellows Membership and Leader Development Committee;
7. Provide other advice, as requested and as appropriate, to the AAOS Board of Directors, Councils and Cabinets, Committees and Project Teams; and
8. Evaluate on a regular basis the goals, objectives, structure and accomplishments of the Resident Assembly.

D. On-going Issues
The Resident Assembly will address a range of issues, through standing committees, to be reviewed and approved by the AAOS Emerging Professionals Committee on an annual basis. These issues will include the following aspects of orthopaedic residency and fellowship training:

1. Career Development: Provide information on building a career in orthopaedics, including fellowship and employment opportunities.
2. Education: Review existing educational resources and recommend new offerings, as well as provide educational opportunities for residents.
3. Research: Promote research opportunities and the use of AAOS quality tools.
4. Health Policy: Address advocacy issues impacting the field of orthopaedic surgery and orthopaedic residency training.
5. Technology Innovation: Identify, develop, test or promote new technologies to facilitate resident productivity and education or to optimize healthcare delivery. Empower AAOS to engage with residents and fellows in training in pursuit of new technologies and to create educational opportunities.

E. Administration and Funding
The Resident Assembly will be administered and funded by the AAOS. No member of the Resident Assembly may negotiate or finalize contracts in any business transaction, or act as an agent or spokesperson for AAOS in accordance with AAOS policies.

Article II: Membership of the Resident Assembly

A. Membership
1. The Resident Assembly is comprised of all active orthopaedic residents and fellows in training residents in fellowship in good standing with their respective orthopaedic surgery residency or fellowship programs.
2. There will be five classes of membership in the Resident Assembly: Resident Member,
Resident Delegate, Emeritus Member, International Member, and Medical Student Member.

a. **Resident Member** - All orthopaedic residents and fellows in training currently enrolled in an approved orthopaedic surgery residency or fellowship program in the United States and Canada are automatically considered to be Resident Assembly Resident Members. This category of membership is provided to both MD and DO trainees.

Resident Members have access to Resident Assembly information and resources through the AAOS website. Resident Members may propose new initiatives or by submitting Advisory Opinions for consideration by the Resident Assembly and its committees through either their respective orthopaedic residency program’s Resident Delegate or with 20 resident member signatures. Throughout the year, Resident Members may participate in any of the standing Resident Assembly Subject Matter Committees or workgroups.

Resident Members may attend the Resident Assembly Annual Meeting. Resident Members do not have voting privileges, with the exception of voting to elect the Chairs of Committees on which they sit as well as At-Large Members of the Executive Committee.

b. **Resident Delegate** - A Resident Delegate is a member appointed by his or her orthopaedic residency program at the discretion of its Program Director to represent that program and his/her fellow residents at the Resident Assembly Annual Meeting. Each orthopaedic residency program will have one vote on any given issue, cast by its Resident Delegate at the AAOS Annual Meeting. Should the Resident Delegate be unable to attend a meeting, a substitute may be appointed by the orthopaedic residency Program Director. Notifications of substitutions shall be submitted no less than 14 days prior to the meeting.

The individual orthopaedic residency program is responsible for funding the attendance of its Resident Delegate to the Resident Assembly Annual Meeting and confirming the Resident Delegate’s understanding of his/her responsibilities.

c. **Emeritus Member** -- An Emeritus Member is a practicing orthopaedic surgeon that has served on an AAOS Resident Assembly Committee or on the AAOS Resident Assembly Executive Committee and wishes to be involved in the AAOS Resident Assembly as a mentor. The Emeritus Member status is available for a maximum of five years after the completion of residency and fellowship training.

Emeritus AAOS Resident Assembly Members do not have voting privileges.

d. **International Resident Member** - Any orthopaedic resident enrolled in an approved international residency program and interested in participating in the Resident Assembly Annual Meeting may do so as an International Member.

International Members do not have voting privileges.

e. **Medical Student Member** - Any medical student planning to apply to residency in orthopaedic surgery within the United States of America or Canada interested in participating in the Annual Meeting of the Resident Assembly may do so as a Medical Student Member.

Medical Student Members do not have voting privileges.

3. All Resident Assembly members shall have access to the Resident Assembly materials at prior to the Resident Assembly Annual Meeting.
4. Selection of Resident Delegates

a. Each orthopaedic residency program may identify one member to represent their respective program as its Resident Delegate. The selection of the Resident Delegate will be determined on a program-by-program basis, but must occur prior to the annual meeting. The term of the Resident Delegate will continue until the resident's graduation from residency unless the resident or program chooses to end their term prior to this date.

b. Each orthopaedic residency program shall establish its own procedures to select its Resident Delegate; however, it is recommended that selection should involve other trainees. The orthopaedic residency program director is responsible for notifying the AAOS of its chosen delegate. The orthopaedic residency program is responsible for notifying the AAOS of its chosen delegate and confirming the Resident Delegate's understanding of his/her responsibilities.

c. The Resident Delegate and his/her respective orthopaedic residency program are responsible for funding the Resident Delegate's travel to the Resident Assembly Annual Meeting.

d. If a Resident Delegate becomes an Officer of the Resident Assembly, that individual shall be deemed to have resigned from his or her Resident Delegate position and his or her respective orthopaedic residency program shall appoint a new Resident Delegate to attend and participate in the Resident Assembly Annual Meeting. If a program is unable to fund the travel of a second resident to the Resident Assembly business meeting, the new officer can serve the dual role as a Resident Delegate for voting purposes at the Annual Meeting.

5. Responsibilities of the Resident Delegate

The Resident Delegate shall:

a. Attend the Resident Assembly Annual Meeting at the AAOS Annual Meeting as the voting representative for his or her orthopaedic residency program;

b. Encourage fellow residents to get involved in the AAOS;

c. Identify one or more Resident Assembly Committees in which to participate during the duration of their term;

d. Reply to Resident Assembly communication requests that require votes or input on various issues and advisory opinions;

e. Communicate about the Resident Assembly Annual Meeting as well as any additional conferences or meetings held throughout the year to their respective orthopaedic residency program;

f. Receive and distribute correspondence and presentations from the Resident Assembly and AAOS to residents in their orthopaedic residency programs;

g. Encourage other orthopaedic residents to complete any AAOS surveys;

h. Be knowledgeable about this document and comply with all Resident Assembly Rules
Article III: Resident Assembly Standing Committees

The Resident Assembly shall have seven standing committees: the Executive Committee, the Nominating Committee, and the five Subject Matter Committees (Article IV).

A. Executive Committee

1. The Executive Committee shall be the primary governing body of the Resident Assembly. All other Resident Assembly committees report to the Executive Committee. The Resident Assembly Executive Committee shall report to the AAOS Emerging Professionals Committee Membership and Leader Development Committee.

2. The Resident Assembly Executive Committee will be comprised of three officers (Chair, Vice-Chair, Past-Chair), five Subject Matter Committee Chairs, and two At-Large Members, selected in accordance with these Rules and Procedures.

3. Election of At-Large Members of the Executive Committee

   a. Any Resident Delegate or a Resident Member who has served one year or more on a Resident Assembly committee may submit a nomination to serve as an At-Large Member of the Resident Assembly Executive Committee.

   b. At-Large Members for the upcoming year will be elected by the Resident Assembly at the Resident Assembly Annual Meeting by a majority vote of the Resident Members and Resident Delegates in attendance.

   b.c. At-Large Members of the Executive Committee serve as the liaison between Resident Delegates, Resident Members and the Executive Committee.

4. Election of Officers and Subject Matter Committee Chairs shall be in accordance with the provisions of Article V herein below.

B. Nominating Committee

1. The Nominating Committee shall be charged with selecting the Chair and Vice-Chair of the Resident Assembly by majority vote prior to the Annual Meeting.

2. The Nominating Committee shall be composed of the Chair of the AAOS Emerging Professionals Committee Membership and Leader Development Committee who will serve as Chair of the Nominating Committee, the Resident Assembly Chair, and one additional AAOS member appointed by the Chair of the AAOS Emerging Professionals Committee Membership and Leader Development Committee.

3. Eligible candidates for the Chair and Vice Chair positions must have served on the previous year’s Executive Committee, and must provide approval from their respective residency programs. The selection will consider the involvement, contributions, and
leadership qualities of each candidate.

4. The Nominating Committee will publicly announce its selection of the Chair and Vice-Chair during the AAOS Annual Meeting.

5. The Nominating Committee will also vet and narrow the pool of applications for Members At-Large prior to a vote by the Resident Assembly.

6. The Nominating Committee will meet as necessary to fulfill its duties set forth herein.

Article IV: Resident Assembly Subject Matter Committees

A. The Resident Assembly will maintain a committee structure to address topics of interest to the AAOS and orthopaedic residents. This will include the following Subject Matter Committees: Career Development, Education, Research, Health Policy, and Technology Innovation.

B. Each committee will be led by a Committee Chair. The committees will report to the Resident Assembly Executive Committee.

C. Committee Chairs and Committee members may participate in AAOS activities within the applicable subject matter areas on invitation from the AAOS.

D. Orthopaedic residents serving on AAOS committees, councils, and cabinets appointed through the Committee Appointment Program (CAP) process are strongly encouraged to participate in the AAOS Resident Assembly and Subject Matter Committees related to their CAP-appointment. All Resident Assembly Subject Matter Committee chairs shall communicate with their related CAP residents on a regular basis. CAP-appointed residents are allowed to also serve any role within the Resident Assembly, including Subject Matter Committee Chair, strongly encouraged to participate in and to run for Chair of the equivalent Resident Assembly Committee. At the least, all Resident Assembly Subject Matter Committee chairs shall communicate with their related CAP residents on a regular basis. Likewise, all CAP-appointed residents will be encouraged to participate in the respective Resident Assembly Committee on a regular basis.

E. Terms of Subject Matter Committee Members

1. Resident Delegates or Resident Members may volunteer to serve as a voting member on any Resident Assembly Subject Matter Committee at any time throughout the year by notifying the Committee Chair Resident Assembly.

2. Resident Delegates or Resident Members serving on a Resident Assembly Subject Matter Committee may remain on the committee throughout their residency and fellowship. They can choose to remove themselves from the committee prior to the end of their training by contacting the committee chair or staff liaison Resident Assembly.

3. Resident Delegates, Resident Members, Emeritus Members, International Members, and Medical Student Members are eligible to attend Subject Matter Committee meetings in which they are not a voting member.

F. Subject Matter Committee Chairs
1. After serving one year on a Resident Assembly Subject Matter Committee, a Resident Member or Resident Delegate is eligible to serve as that committee’s Chair position for the following year.

2. Resident Delegates and all Resident Assembly Members—even if they are not Resident Delegates—may serve as members of a Resident Assembly Subject Matter Committee.

2.3. Current members of each Subject Matter Committee elect the incoming Committee Chair from among its own eligible Resident and Delegate Members. A majority of Resident Delegate and Resident Members present and voting determines the new Chair.

3.4. The Committee Chair position is a one-year term, subject to possible re-election for an additional one-year term.

4.5. Should a Committee Chair need to withdraw during the year, the vacancy will be posted on the AAOS website and another Committee member will be selected as Interim-Chair by the Executive Committee until the next Resident Assembly Annual Meeting.

6. If a Committee Chair is unable to attend a Committee meeting, the Committee Chair will delegate Committee Chair responsibilities to a Committee member.

F. Selection of Committee Chairs shall be in accordance with the Resident Assembly Policies and Procedures manual.

Article V: Resident Assembly Officers

A. The Resident Assembly Officers shall be the Chair, Vice-Chair, and Past Chair. The Chair and Vice-Chair will be selected by the Nominating Committee prior to the AAOS Annual Meeting.

B. The term of office is one year, which shall commence at the conclusion of the AAOS Annual Meeting after approval by the Nominating Committee.

C. A vacancy in the position of Vice-Chair or Chair will be filled by the Emerging Professionals Nominating Committee.

D. Chair. The Chair shall preside over meetings of the Resident Assembly Annual Meeting and the Executive Committee without privilege of voting except to break a tie vote. The Chair of the Resident Assembly shall serve as the official voice of the Resident Assembly in communications with AAOS as well as the official liaison to other AAOS entities.

1. In the absence of the Chair at a meeting of the Resident Assembly or Executive Committee, the Vice-Chair will fulfill these duties.

E. Vice-Chair. The Vice-Chair will work with AAOS staff to ensure that the Resident Assembly follows the rules set out herein.

1. Agendas for all Resident Assembly meetings are prepared;
2. Proceedings of the Resident Assembly Annual Meeting are available to the Resident Assembly, Resident Delegates, and Resident Members;
3. All correspondence, communication, and record keeping of the Resident Assembly and Executive Committee, including maintaining these Rules and Procedures, are completed; and
4. Proper and fair appointments for positions within the Resident Assembly have occurred.
5. All Resident Assembly documents are accurate and kept up to date.
F. **Past Chair.** The Past Chair will serve in an advisory role to assist in the transition with the new leadership of the Resident Assembly.

1. Act as Chair of a workgroup as needed;
2. Participate in Resident Assembly conference calls and Resident Assembly officer planning sessions; and
3. Assist and advise the Chair upon request.

**Article VI: Resident Assembly at the AAOS Annual Meeting**

A. The Resident Assembly Annual Meeting shall occur during the AAOS Annual Meeting. The Resident Assembly provides a chance for orthopaedic surgery residents and fellows in training to meet to discuss issues, review previous efforts, and plan for the future of the Resident Assembly. In addition, elections for At-Large members of the Executive Committee will be determined for the upcoming year.

B. Proposed Advisory Opinions. Resident Delegates and Resident Members may submit proposed Advisory Opinions to the Vice-Chair for consideration at these meetings. An Advisory Opinion is a formal resolution from the Resident Assembly. It is not a product of a systematic review, but rather results from deliberation and votes taken at the Resident Assembly Annual Meeting.

C. Voting and Dissemination

1. The Officers will oversee all voting, including election of At-Large members of the Executive Committee and on Advisory Opinions at the Resident Assembly Annual Meeting. They will tally votes from Resident Members and Resident Delegates.

1.2. In the event of a tie in a vote on Advisory Opinions, the Resident Assembly Chair will cast the deciding vote or, at his or her discretion, decide to table an Advisory Opinion for further review and consideration at a future meeting.

2. A list of all Advisory Opinions adopted by the Resident Assembly will be compiled and submitted to the AAOS Emerging Professionals CommitteeMembership and Leader Development Committee.

2.3. Minutes of the Resident Assembly Annual Meeting will be prepared and distributed to the Executive Committee and Resident Delegates shortly after the Resident Assembly Annual Meeting for dissemination to interested parties.

**Article VIII: Parliamentary Authority**

All meetings of the Resident Assembly, Executive Committee and Subject Matter Committees shall be governed by standard parliamentary procedures that provide for adequate notice and a fair opportunity for debate. The Presiding Officer may be guided by, but not bound by, the most current edition of Robert's “Rules of Order.”

**Article IX: Amendments**

A. The Resident Assembly may find it necessary to recommend changes to these Rules and Procedures to better meet the Resident Assembly’s purpose.

B. Changes to these Rules and Procedures may be proposed by the Executive Committee or any five (5) Resident Delegates no later than sixty (60) days prior to the Resident Assembly Annual Meeting. Notice of these proposed changes must be provided to all Resident Delegates at least thirty (30) days prior to the Resident Assembly Annual Meeting. A revision of these Rules and Procedures requires a two-thirds vote of those Resident Delegates present and voting at the Annual Meeting.
C. After being adopted by a two-thirds vote at the Annual Meeting of the Resident Assembly, the proposed Rules and Procedures must be approved by the AAOS Emerging Professionals Committee, Membership and Leadership Development Committee, and AAOS Board of Directors in order to become effective.

Approved by the AAOS Board of Directors on September 15, 2017.
Approved by the Resident Assembly on March 16, 2017.
RESIDENT ASSEMBLY ORGANIZATION

Executive

Officer

5 Subject Matter Committee Chairs

2 At-Large

Chair

Past
AAOS Resident Assembly Rules:
Approved 9.15.17
<table>
<thead>
<tr>
<th>Article I:</th>
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</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>Article V:</td>
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</tr>
<tr>
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</tr>
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Article I: Resident Assembly

A. Name

1. There shall be an AAOS Resident Assembly ("Resident Assembly"). The Resident Assembly shall represent all orthopaedic surgery residents who are pursuing ABOS certification in the United States and Canada.

2. The Resident Assembly shall have elected officers and leadership committees.

3. The Resident Assembly shall report to and coordinate with the AAOS Emerging Professionals Committee.

B. Purpose

The purpose of the Resident Assembly shall be to:

1. Serve as a representative, deliberative, and advisory body to the AAOS regarding matters of concern to orthopaedic residents;

2. Provide an advisory voice for orthopaedic residents within the AAOS and assist the decision-making bodies of the AAOS with topics pertaining to orthopaedic residents and education;

3. Enhance and maintain communications between the AAOS and orthopaedic residents; facilitate communication and the dissemination of AAOS policy within individual orthopaedic residency programs;

4. Encourage increased opportunities for involvement and participation by orthopaedic residents in AAOS educational and research affairs; and

5. Consider and make recommendations regarding the AAOS issues as requested.

In each of the above activities, the Resident Assembly will foster greater orthopaedic resident involvement in the AAOS in the anticipation that this engagement will persist beyond residency training years.

C. Duties

The duties of the Resident Assembly shall be to:

1. Assist in the execution and implementation of AAOS initiatives;

2. Conduit for AAOS to provide members and residency programs information and resources;
3. Identify and communicate issues and concerns of orthopaedic residents to the AAOS;

4. Develop recommendations on AAOS policies, activities and programs upon request;

5. Facilitate orthopaedic resident involvement within the AAOS;

6. Develop Resident Assembly Advisory Opinions to be submitted to the AAOS Candidate, Resident and Fellows Committee;

7. Provide other advice, as requested and as appropriate, to the AAOS Board of Directors, Councils and Cabinets, Committees and Project Teams; and

8. Evaluate on a regular basis the goals, objectives, structure and accomplishments of the Resident Assembly.

D. On-going Issues

The Resident Assembly will address a range of issues, through standing committees, to be reviewed and approved by the AAOS Emerging Professionals Committee on an annual basis. These issues will include the following aspects of orthopaedic residency training:

1. Career Development: Provide information on building a career in orthopaedics, including fellowship and employment opportunities.

2. Education: Review existing educational resources, recommend new offerings, as well as provide educational opportunities for residents.

3. Research: Promote research opportunities and the use of AAOS quality tools.

4. Health Policy: Address issues impacting the field of orthopaedic surgery and orthopaedic residency training.

5. Technology: Identify, develop, test or promote new technologies to facilitate resident productivity, education and optimize healthcare.

E. Administration and Funding

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Article II: Membership of the Resident Assembly

A. Membership

1. The Resident Assembly is comprised of all active orthopaedic residents and fellows in good standing with their respective orthopaedic surgery residency or fellowship programs.

2. There will be five classes of membership in the Resident Assembly: Resident Member, Resident Delegate, Emeritus Member, International Member, and Medical Student Member.

   a. Resident Member: All orthopaedic residents and fellows currently enrolled in an approved residency or fellowship program in the United States and Canada are automatically considered to be Resident Assembly Resident Members. This category of membership is provided to both MD and DO trainees.
Resident Members have access to Resident Assembly information and resources through the AAOS website. Resident Members may propose new initiatives or Advisory Opinions for consideration by the Resident Assembly and its committees through their respective orthopaedic residency program’s Resident Delegate. Throughout the year, Resident Members may participate in any of the standing Resident Assembly Subject Matter Committees.

Resident Members may attend the Resident Assembly Annual Meeting. Resident Members do not have voting privileges, with the exception of voting to elect the Chairs of Committees on which they sit as well as At-Large Members of the Executive Committee.

b. Resident Delegate - A Resident Delegate is a member appointed by his or her orthopaedic residency program at the discretion of its Program Director to represent that program and fellow residents at the Resident Assembly Annual Meeting. Each orthopaedic residency program will have one vote on any given issue, cast by its Resident Delegate. Should the Resident Delegate be unable to attend a meeting a substitute may be appointed by the orthopaedic residency Program Director. Notifications of substitutions shall be submitted no less than 14 days prior to the meeting.

The individual orthopaedic residency program is responsible for funding the attendance of its Resident Delegate to the Resident Assembly Annual Meeting and confirming the Resident Delegate’s understanding of responsibilities.

c. Emeritus Member – An Emeritus Member is a practicing orthopaedic surgeon that has served on an AAOS Resident Assembly Committee or on the AAOS Resident Assembly Executive Committee and wishes to be involved in the AAOS Resident Assembly as a mentor. The Emeritus Member status is available for a maximum of five years after completion of residency and fellowship training.

Emeritus AAOS Resident Assembly Members do not have voting privileges.

d. International Resident Member - Any orthopaedic resident enrolled in an approved international residency program and interested in participating in the Resident Assembly Annual Meeting may do so as an International Member.

International Members do not have voting privileges.

e. Medical Student Member - Any medical student planning to apply to residency in orthopaedic surgery within the United States of America or Canada interested in participating in the Annual Meeting of the Resident Assembly may do so as a Medical Student Member.

Medical Student Members do not have voting privileges.

3. All Resident Assembly members shall have access to the Resident Assembly materials at the Resident Assembly Annual Meeting.

4. Selection of Resident Delegates

a. Each orthopaedic residency program may identify one member to represent the respective program as its Resident Delegate. The selection of the Resident Delegate will be determined on a program-by-program basis, but must occur prior to the annual meeting.
b. Each orthopaedic residency program shall establish its own procedures to select the Resident Delegate; however, it is recommended that selection should involve other trainees. The orthopaedic residency program director is responsible for notifying the AAOS of its chosen delegate.

a. The Resident Delegate and his or her respective orthopaedic residency program are responsible for funding the Resident Delegate’s travel to the Resident Assembly Annual Meeting.

b. If a Resident Delegate becomes an Officer of the Resident Assembly, that individual shall be deemed to have resigned from his or her Resident Delegate position and his or her respective orthopaedic residency program shall appoint a new Resident Delegate to attend and participate in the Resident Assembly Annual Meeting. If a program is unable to fund the travel of a second resident, the new officer can serve the dual role as a Resident Delegate.

2. Responsibilities of the Resident Delegate

The Resident Delegate shall:

a. Attend the Resident Assembly Annual Meeting at the AAOS Annual Meeting as the voting representative for his or her orthopaedic residency program;

b. Encourage fellow residents to get involved in the AAOS;

c. Identify one Resident Assembly Committee in which to participate during the duration of their term;

d. Reply to Resident Assembly communication requests which require votes or input on various issues and advisory opinions;

e. Communicate about the Resident Assembly Annual Meeting as well as any additional conferences or meetings held throughout the year to their respective orthopaedic residency program;

f. Receive and distribute correspondence from the Resident Assembly and AAOS to residents in their orthopaedic residency programs;

 g. Encourage other orthopaedic residents to complete any AAOS survey;

h. Be knowledgeable about this document and comply with all Resident Assembly Rules and Procedures.

i. Submit Advisory Opinions and debate Advisory Opinions.

j. Advise their Resident Assembly committee of any issues or concerns of their respective orthopaedic residency program.

Article III: Resident Assembly Standing Committees

The Resident Assembly shall have seven standing committees: the Executive Committee, the Nominating Committee, and the five Subject Matter Committees (Article IV).
A. Executive Committee

1. The Executive Committee shall be the primary governing body of the Resident Assembly. All other Resident Assembly committees report to the Executive Committee. The Resident Assembly Executive Committee shall report to the AAOS Emerging Professionals Committee.

2. The Resident Assembly Executive Committee will be comprised of three officers (Chair, Vice-Chair, Past-Chair), five Subject Matter Committee Chairs, and two At-Large Members, selected in accordance with these Rules and Procedures.

3. Election of At-Large Members of the Executive Committee
   a. Any Resident Delegate or a Resident Member who has served one year or more on a Resident Assembly committee may submit a nomination to serve as an At-Large Member of the Resident Assembly Executive Committee.
   b. At-Large Members for the upcoming year will be elected by the Resident Assembly at the Resident Assembly Annual Meeting by a majority vote of Resident Members and Resident Delegates in attendance.

4. Election of Officers and Subject Matter Committee Chairs shall be in accordance with the provisions of Article V herein below.

B. Nominating Committee

1. The Nominating Committee shall be charged with selecting the Chair and Vice-Chair of the Resident Assembly by majority vote prior to the Annual Meeting.

2. The Nominating Committee shall be composed of the Chair of the AAOS Emerging Professionals Committee who will serve as Chair of the Nominating Committee, the Resident Assembly Chair, and one additional AAOS member appointed by the Chair of the AAOS Emerging Professionals Committee.

3. Eligible candidates for the Chair and Vice Chair positions must have served on the previous year’s Executive Committee, and must provide approval from their respective residency programs. The selection will consider the involvement, contributions, and leadership qualities of each candidate.

4. The Nominating Committee will publicly announce its selection of the Chair and Vice-Chair during the AAOS Annual Meeting.

5. The Nominating Committee will also vet and narrow the pool of applications for Members At-Large prior to a vote by the Resident Assembly.

6. The Nominating Committee will meet as necessary to fulfill its duties set forth herein.

Article IV: Resident Assembly Subject Matter Committees

A. The Resident Assembly will maintain a committee structure to address topics of interest to the AAOS and orthopaedic residents. This will include the following Subject Matter Committees: Career Development, Education, Research, Health Policy, and Technology.
B. Each committee will be led by a Committee Chair. The committees will report to the Resident Assembly Executive Committee.

C. Committee Chairs and Committee members may participate in AAOS activities within the applicable subject matter areas on invitation from the AAOS.

D. Orthopaedic residents serving on AAOS committees, councils, and cabinets appointed through the Committee Appointment Program (CAP) process are strongly encouraged to participate in and to run for Chair of the equivalent Resident Assembly Committee. At the least, All Resident Assembly Subject Matter Committee chairs shall communicate with their related CAP residents on a regular basis. Likewise all CAP-appointed residents will be encouraged to participate in the respective Resident Assembly Committee on a regular basis.

E. Terms of Subject Matter Committee Members

1. Resident Delegates or Resident Members may volunteer to serve as a voting member on any Resident Assembly Subject Matter Committee at any time throughout the year by notifying the Committee Chair. Resident Delegates, Resident Members, Emeritus Members, International Members, and Medical Student Members are welcome to attend Subject Matter Committee meetings in which they are not a voting member.

F. Subject Matter Committee Chairs

1. After serving one year on a Resident Assembly Subject Matter Committee, a Resident Member or Resident Delegate is eligible to serve as that committee’s Chair position for the following year.

2. Resident Delegates and all Resident Assembly Members (even if they are not Resident Delegates) may serve as members of a Resident Assembly Subject Matter Committee. Current members of each Subject Matter Committee elect the incoming Committee Chair from among its own eligible Resident and Delegate Members. A majority of Resident Delegate and Resident Members present and voting determines the new Chair.

3. The Committee Chair position is a one-year term, subject to possible re-election for an additional one-year term.

4. Should a Committee Chair need to withdraw during the year, the vacancy will be posted on the AAOS website and another Committee member will be selected as Interim-Chair by the Executive Committee until the next Resident Assembly Annual Meeting.

5. If a Committee Chair is unable to attend a Committee meeting, the Committee Chair will delegate Committee Chair responsibilities to a Committee member.

Article V: Resident Assembly Officers

A. The Resident Assembly Officers shall be the Chair, Vice-Chair, and Past Chair. The Chair and Vice-Chair will be selected by the Nominating Committee prior to the AAOS Annual Meeting.

B. The term of office is one year, which shall commence at the conclusion of the AAOS Annual Meeting after approval by the Nominating Committee.

C. A vacancy in the position of Vice-Chair or Chair will be filled by the Emerging Professionals Committee.

D. Chair. The Chair shall preside over meetings of the Resident Assembly Annual Meeting and the Executive Committee without privilege of voting except to break a tie vote. The Chair of the
Resident Assembly shall serve as the official voice of the Resident Assembly in communications with AAOS as well as the official liaison to other AAOS entities.

1. In the absence of the Chair at a meeting of the Resident Assembly or Executive Committee, the Vice-Chair will fulfill these duties.

E. Vice-Chair. The Vice-Chair will work with AAOS staff to ensure that:

1. Agendas for all Resident Assembly meetings are prepared;
2. Proceedings of the Resident Assembly Annual Meeting are available to the Resident Assembly Resident Delegates and Resident Members;
3. All correspondence, communication, and record keeping of the Resident Assembly and Executive Committee, including maintaining these Rules and Procedures, are completed; and
4. Proper and fair appointments for positions within the Resident Assembly have occurred.
5. All Resident Assembly documents are accurate and kept up to date.

F. Past Chair. The Past Chair will serve in an advisory role to assist in the transition with the new leadership of the Resident Assembly.

1. Act as Chair of a workgroup as needed;
2. Participate in Resident Assembly conference calls and Resident Assembly officer planning sessions; and
3. Assist and advise the Chair upon request.

Article VI: Resident Assembly at the AAOS Annual Meeting

A. The Resident Assembly Annual Meeting shall occur during the AAOS Annual Meeting. The Resident Assembly provides a chance for orthopaedic surgery residents to meet discuss issues, review previous efforts, and plan for the future of the Resident Assembly. In addition, elections for At-Large members of the Executive Committee will be determined for the upcoming year.

B. Proposed Advisory Opinions. Resident Delegates and Resident Members may submit proposed Advisory Opinions to the Vice-Chair for consideration at these meetings. An Advisory Opinion is a formal resolution from the Resident Assembly. It is not a product of a systematic review, but rather results from deliberation and votes taken at the Resident Assembly Annual Meeting.

C. Voting and Dissemination

1. The Officers will oversee all voting, including election of At-Large members of the Executive Committee and on Advisory Opinions at the Resident Assembly Annual Meeting. They will tally votes from Resident Members and Resident Delegates. In the event of a tie in a vote, the Resident Assembly Chair will cast the deciding vote or, at his or her discretion, decide to table an Advisory Opinion for further review and consideration at a future meeting.

2. A list of all Advisory Opinions adopted by the Resident Assembly will be compiled and submitted to the AAOS Emerging Professionals Committee.

3. Minutes of the Resident Assembly Annual Meeting will be prepared and distributed to the Executive Committee and Resident Delegates shortly after the Resident Assembly Annual Meeting for dissemination to interested parties.

Article VIII: Parliamentary Authority

All meetings of the Resident Assembly, Executive Committee and Subject Matter Committees shall be governed by standard parliamentary procedures that provide for adequate notice and a fair opportunity
for debate. The Presiding Officer may be guided by, but not bound by, the most current edition of Robert’s “Rules of Order.”

Article IX: Amendments

A. The Resident Assembly may find it necessary to recommend changes in these Rules and Procedures to better meet the Resident Assembly’s purpose.

B. Changes to these Rules and Procedures may be proposed by the Executive Committee or any five (5) Resident Delegates no later than sixty (60) days prior to the Resident Assembly Annual Meeting. Notice of these proposed changes must be provided to all Resident Delegates at least thirty (30) days prior to the Resident Assembly Annual Meeting. A revision of these Rules and Procedures requires a two-thirds vote of those Resident Delegates present and voting at the Annual Meeting.

C. After being adopted by a two-thirds vote at the Annual Meeting of the Resident Assembly, the proposed Rules and Procedures must be approved by the AAOS Emerging Professionals Committee; Membership and Leadership Development Committee; and AAOS Board of Directors in order to become effective.

-------------------------------------------------------------------------------------------------------------------------

Approved by the AAOS Board of Directors on September 15, 2017.
Approved by the Resident Assembly on March 16, 2017.
RESIDENT ASSEMBLY ORGANIZATION

Executive Committee

Officers

5 Subject Matter Committee Chairs

Vice-Chair

Past Chair

2 At-Large Members

Chair

Past Chair
WHEREAS:
Across all orthopaedic subspecialties, there does not exist a central database of fellowship program information that provides resident applicants with up-to-date program information. All subspecialties but hand provide information on their fellowship through the SF Match, which links to each subspecialty. The information is not uniform and most often updated by program coordinators, and not always up-to-date. The BOS Fellowship Committee has asked each society to list relevant information for residents.

WHEREAS:
Other medical associations, such as the AMA with FRIEDA (https://www.ama-assn.org/residents-students/match/freida), have successfully run online, searchable databases for post graduate training programs. It would be greatly beneficial to orthopaedic residents and programs alike to have a standardized database of information on fellowships. This database can contain information on the most frequently asked questions regarding fellowships. The AAOS did this through their handbook, but society post-match surveys indicated less than 10% of residents historically use this resource.

WHEREAS:
While some orthopaedic professional societies, such as American Society for Surgery of the Hand (https://myaccount.assh.org/FellowshipDirectory) and the Orthopaedic Trauma Association (https://ota.org/fellowship/fellowship-directory) do provide a specialty-specific database, this is not the case for all subspecialties.

WHEREAS:
During the past year the AAOS Resident Assembly Education Committee investigated what information is currently available for all orthopaedic subspecialty fellowships and sought the opinions of residents who have already matched into fellowships. From our investigation, a core set of important fellowship program characteristics were identified in the domains of general program information, research, education, and interview logistics;

WHEREAS:
With this information, residents can better assess the fit of fellowship programs with their desired interests, thereby reducing the number of applications they submit as well as the number of
WHEREAS:
AAOS is the leading source of orthopaedic information for residents and recently has begun hosting the fellowship match. It would thus be a foreseeable progression for AAOS to also become the leading resource for information pertaining to fellowship programs participating in the fellowship match.

RESOLVED A:
The AAOS shall work with specialty societies, fellowship programs, and SF Match to create or improve an already existing online database of orthopedic fellowship positions that shall contain the crucial information already identified, and be if further;

RESOLVED B:
The AAOS Resident Assembly shall provide assistances as necessary in the creation of this database.

References:
3. AAOS Postgraduate Orthopaedic Fellowship Directory https://www7.aaos.org/education/fellowshipbook/fellowshipsearch.aspx?_ga=2.191804970.1098056577.1551106136-85958632.1551106136&ga=2.191804970.1098056577.1551106136-85958632.1551106136&ct=d9259dfad9802f82ec55cc209e167373d125c37618c69efb636e47abe1313d5beac71a520abfe3295835323b370c139e29731bde245ad360bd34946a66f57
4. SF Match: https://sfmatch.org/SubSpecialties.aspx?id=32&typ=1
Orthopaedic Sports Medicine Fellowship Interviews: Structure and Organization of the Interview Day

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Abstract

Background:

Over the past few decades, there has been a trend toward an increasing subspecialization in orthopaedic surgery, with orthopaedic sports medicine being one of the most competitive subspecialties. Information regarding the application and interview process for sports medicine fellowships is currently lacking.

Purpose:

To survey orthopaedic sports medicine fellowship program directors (PDs) to better define the structure of the sports medicine fellowship interview and to highlight important factors that PDs consider in selecting fellows.

Study Design:

Cross-sectional study.

Methods:
A complete list of accredited programs was obtained from the American Orthopaedic Society for Sports Medicine (AOSSM) website. An anonymous survey was distributed to fellowship PDs of all Accreditation Council for Graduate Medical Education (ACGME)–accredited orthopaedic sports medicine fellowships in the United States. The survey included 12 questions about the fellowship interview and selection process.

**Results:**

Of the 95 orthopaedic sports medicine fellowship PDs surveyed, 38 (40%) responded. Of these, 16 (42.1%) indicated that they interview between 21 and 30 applicants per year. Eleven of the 38 fellowship programs (28.9%) have only 1 fellow per year at their respective program. Most programs (27/37, 73%) reported that between 0 and 5 faculty members interview applicants, and 29 of the 38 programs (76.3%) arrange for applicants to have ≥4 interviews during their interview day. Large group interviews are conducted at 36 of 38 (94.7%) sports medicine fellowship programs, and most programs (24/38, 63.2%) hold individual interviews that last between 5 and 15 minutes. The most important applicant criterion taken into account by PDs was the quality of the interview, with an average score of 8.68 of 10.

**Conclusion:**

The most significant factor taken into account by PDs when deciding how to rank applicants was the quality of the interview. Many orthopaedic sports medicine fellowship programs interview between 21 and 30 applicants per year, with each applicant participating in an average of 2 to 4 individual interviews per interview day and interviews commonly lasting between 5 and 15 minutes.

**Keywords:** sports medicine, fellowship, fellow education

Over the past few decades, there has been a trend toward increasing subspecialization in orthopaedic surgery. Changes in the job market, Accreditation Council for Graduate Medical Education (ACGME)–mandated work-hour restrictions, and confidence as a surgeon are all factors that contribute to the shifting environment in orthopaedic education. Numerous benefits of orthopaedic subspecialization have been proposed, including financial stability and job security. In 2007, Ranawat et al surveyed 50 graduating orthopaedic residents regarding their plans after graduation from residency. The authors found that approximately 90% of graduating orthopaedic surgeons chose to pursue at least 1 year of fellowship training. Furthermore, sports medicine has been one of the most popular orthopaedic fellowships for several years, with 40% of residents stating that they were applicants in a 2005 American Orthopaedic Association (AOA) forum.

Information regarding the application and interview process for sports medicine fellowships is currently lacking. A study by Mulcahey et al in 2013 evaluated the content and accessibility of websites for accredited orthopaedic sports medicine fellowships. The authors found that of all accredited sports medicine fellowships listed on the American Orthopaedic Society for Sports Medicine (AOSSM) website, only 3% had websites that were linked to information about their respective fellowship. Similarly, of the 88% of sports medicine fellowships with links on the San Francisco Match website, only 5% connected directly to their respective fellowship. Fellowship websites were also assessed for specific content, such as the fellowship program’s previous research and call responsibilities. Data pertaining to fellow education were sparse, as each of these criteria was generally represented by less than half of the programs. A follow-up study 3 years later demonstrated that there had been no appreciable improvement in the information available to fellowship applicants.
Currently, there are few studies that define the factors that are thought to be important by orthopaedic sports medicine fellowship program directors (PDs) in selecting applicants for interviews and ultimately determining their rank list. There are, however, numerous studies that define important factors in the selection process for other orthopaedic surgery fellowships. A 2013 study by Grabowski and Walker surveyed all orthopaedic subspecialty fellowship PDs on distinct selection criteria. The authors found that fellowship selection criteria differed from those used in selecting residents in that fellowships placed more emphasis on qualitative aspects of the application (eg, letters of recommendation) rather than quantitative aspects (eg, Orthopaedic In-Training Examination scores). Given the competitive nature of applying for orthopaedic sports medicine fellowships, it is important for applicants to have a good understanding of the interview structure, common expectations for the fellowship year, and factors that are considered to be important for matching to an orthopaedic sports medicine fellowship program. The purpose of this study was to survey orthopaedic sports medicine fellowship PDs to better define the structure of the sports medicine fellowship interview and to highlight important factors that PDs consider in selecting fellows.

Methods

After obtaining approval from the institutional review board at our institution (protocol No. 1701005083), an anonymous survey was distributed to the directors of all ACGME-accredited orthopaedic sports medicine fellowship programs in the United States. A complete list of accredited programs was obtained from the AOSSM website. The survey included 12 questions about the fellowship interview and application process (see the Appendix). Respondents were also asked 1 question regarding their geographic region; therefore, there was a total of 13 questions within the survey. A follow-up email was sent 2 and 4 weeks later to encourage more participation. Standard descriptive statistics were used to analyze responses to the survey.

Results

Of the 95 orthopaedic sports medicine fellowship PDs surveyed, 38 (40%) responded. There was a wide geographic distribution of respondents, with the highest percentages from West B (7/38, 18.4%), Midwest A (6/38, 15.8%), and South A (6/38, 15.8%) (Figure 1).

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5753957/
Of the 38 PDs who responded to the survey, 16 (42.1%) stated they interview between 21 and 30 residents, 7 (18.4%) interview between 16 and 20 residents, and 6 (15.8%) interview between 31 and 40 residents. Eleven of the 38 fellowship programs (28.9%) have 1 fellow per year at their respective program (Figure 2).
Figure 2.
Number of fellows enrolled at each orthopaedic sports medicine fellowship program.

PDs were asked to rank 15 factors used in selecting applicants for interviews on a scale of 1 to 10 (with 1 being least important and 10 being most important) (Table 1). The 5 most important factors identified were quality of the interview (8.68), letter from a faculty member at the PD’s institution (7.58), letter from an orthopaedic surgeon whom the applicant works with (7.58), quality of the residency program (7.21), and telephone call placed on the candidate’s behalf (6.92). The least important factor was whether the resident expressed interest in the program through a telephone call or email (Table 1).
TABLE 1
Criteria Used in Selecting Orthopaedic Sports Medicine Fellowship Applicants for Interviews *

<table>
<thead>
<tr>
<th>Score</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of interview</td>
<td>8.68</td>
</tr>
<tr>
<td>Letter from a faculty member at the interviewer’s institution</td>
<td>7.58</td>
</tr>
<tr>
<td>Letter from an orthopaedic surgeon whom the applicant works with</td>
<td>7.58</td>
</tr>
<tr>
<td>Quality of residency program</td>
<td>7.21</td>
</tr>
<tr>
<td>Telephone call placed on the candidate’s behalf</td>
<td>6.92</td>
</tr>
<tr>
<td>Letter from the director of the applicant’s residency</td>
<td>6.50</td>
</tr>
<tr>
<td>Publications</td>
<td>6.24</td>
</tr>
<tr>
<td>USMLE scores</td>
<td>5.47</td>
</tr>
<tr>
<td>Orthopaedic In-Training Examination scores</td>
<td>5.16</td>
</tr>
<tr>
<td>Personal statement</td>
<td>4.82</td>
</tr>
<tr>
<td>Applicant has various hobbies outside of medicine</td>
<td>4.58</td>
</tr>
<tr>
<td>AOA membership</td>
<td>4.42</td>
</tr>
<tr>
<td>Medical school rank</td>
<td>4.03</td>
</tr>
<tr>
<td>MD/PhD</td>
<td>3.68</td>
</tr>
<tr>
<td>Applicant has expressed interest in the program (telephone call or email)</td>
<td>3.16</td>
</tr>
</tbody>
</table>

*Scored on a scale of 1 to 10, with 1 being least important and 10 being most important. Ratings were then averaged to calculate the score. AOA, American Orthopaedic Association; USMLE, United States Medical Licensing Examination.

There is a wide range in the number of faculty members who are involved in interviewing residents for orthopaedic sports medicine fellowships. One PD elected not to respond to this question, leaving a total of 37 respondents. Of the 37 respondents, 21 (56.8%) reported that 0 to 5 faculty members interview applicants. At 12 programs (32.4%), 6 to 10 faculty members interview applicants, while 4 (10.8%) programs have 11 to 15 faculty members interviewing applicants. Current fellows interview applicants at 19 (50.0%) programs.

The length of the interview day varies between programs. Eighteen of the 37 respondents (48.6%) interview for half of the day (eg, 8 AM to 12 PM), whereas the remaining 19 programs (51.4%) have applicants stay for a full day (eg, 8 AM to 4 PM). The length of each interview ranges from 5 and 15 minutes to 90 minutes. Twenty-four of the 38 programs (63.2%) hold individual interviews that last between 5 and 15 minutes. Twenty-nine programs (76.3%) arrange for applicants to have ≥4 interviews during their interview day. Large group interviews (ie, >5 faculty members) are required at 36 of the 38 sports medicine fellowship programs (94.7%). None of the programs reported that they use...
standardized questions during each interview (2 programs chose not to respond). Of the 37 respondents, 8 (21.6%) stated that they incorporate themes for some of their interview rooms, while 29 (78.4%) stated that they do not have a predetermined theme for each room.

Discussion

A paucity of information is available to orthopaedic sports medicine fellowship applicants regarding the structure of the fellowship interview and factors considered to be important in the selection and ranking process. This study demonstrates that there is considerable variability among sports medicine fellowship programs in terms of the number of applicants interviewed, the number of separate interviews conducted on the interview day, and the number of faculty members involved in the interview process.

Residency PDs use United States Medical Licensing Examination (USMLE) scores and medical school rank as major determinants in selecting applicants to interview and ultimately ranking the applicants; however, the same emphasis does not seem to hold true at the fellowship level.3,11–13 In our study, USMLE scores were considered the 8th most important factor of a list of 15, while AOA membership was ranked 12th of 15. The top 3 criteria for interview selection and final rank order for orthopaedic sports medicine fellowship applicants were quality of the interview, a letter from a faculty member at the PD’s institution, and a letter from an orthopaedic faculty member at the resident’s institution. These results further support data from the current literature, which suggest that qualitative factors are the most important in selecting applicants for sports fellowship interviews and determining their ultimate position on the rank list.5 This speaks to the importance of obtaining strong letters of recommendation when applying for orthopaedic sports medicine fellowships.

The literature regarding the structure of the interview day for fellowship programs is limited, and when reported, the information is frequently nonspecific. In 2013, Egol et al5 summarized the information available in previous studies that surveyed medical students and residency PDs about the orthopaedic residency interview process. The authors found that the structure of the orthopaedic residency interview day varies considerably and is dependent largely on the individual institution’s style of interview.4 Each program decides on an appropriate number of separate interview rooms, number of faculty members involved with the interviews, and length of the interview day.3,4 The results from our study demonstrate that sports medicine fellowship PDs arrange for applicants to undergo at least 2 interviews during the interview day and that the majority of institutions (76.3%) require at least 4 interviews per applicant. Residents should therefore anticipate having to participate in 2 to 4 interviews at each institution, with most interviews (63.2%) lasting between 5 and 15 minutes.

There is some variability in the length of the interview day, with 51.4% of programs requiring a full-day visit and 48.6% of programs clustering their interviews into a half day. More time away from work is necessary to attend full-day interviews. Additionally, this structure may make it more difficult for an applicant to travel to another interview location in time to attend a social gathering or to prepare for the interview the following day. General surgery and orthopaedic residents commonly interview at a minimum of 8 fellowship programs.9,16 A substantial amount of time away from work is needed for travel and for the interviews themselves. According to Oladeji et al,2 86% of residents miss at least 8 days from work to interview for fellowships. The study further demonstrated that 70% of orthopaedic residency PDs found the fellowship interview process to be disruptive and that 69% felt that it should undergo a fundamental change.2

There are several limitations to this study. Our response rate was 40%, and therefore, the results may not reflect the views of all sports medicine fellowship PDs. The sample size was limited to a minority of geographic locations, so the distribution of respondents may not represent geographic locations of all sports medicine fellowship programs. Published studies on orthopaedic education commonly have
response rates that are similar to ours.\textsuperscript{1,6,9} Our survey may not have included all factors that fellowship directors and/or applicants consider to be important in the application, selection, interview, and ranking process. Another potential factor that PDs could take into account would be the evaluation of performance on a manual skills test. Additionally, some studies used postinterview criteria (eg, formality and politeness of the candidate) and performance on ethical or manual tests during the interview.\textsuperscript{1,8} Finally, responses to some of the questions in the survey may have been influenced by individual interpretation.

**Conclusion**

The most significant factor taken into account by PDs when deciding how to rank applicants was the quality of the interview. Many orthopaedic sports medicine fellowship programs interview between 21 and 30 applicants per year, with each applicant participating in an average of 2 to 4 individual interviews per interview day and interviews commonly lasting between 5 and 15 minutes. These results help define the process of deciding where to apply and interview and ultimately how to rank orthopaedic sports medicine fellowship programs. Sports medicine fellowship applicants may use this information to gain a better understanding of the interview and selection process.

**Appendix**

Orthopaedic Sports Medicine Fellowship Director Survey\textsuperscript{a}
ACGME, Accreditation Council for Graduate Medical Education; AOA, American Orthopaedic Association; USMLE, United States Medical Licensing Examination.

Footnotes
The authors declared that they have no conflicts of interest in the authorship and publication of this contribution. Ethical approval for this study was obtained from the Drexel University Office of Research (No. 1701005083).

References


How to Approach Fellowship Match: Tips for the Applicant and Fellowship Programs

Thomas A. Krupko, MD* and Lisa K. Cannada, MD†

The orthopaedic fellowship match process has become an important part of training in the past several years. The Orthopaedic Trauma Association (OTA) had a match, like many other subspecialties in the 1990s. The match process was disorganized and chaotic for applicants and programs alike and dissolved for most specialties. The OTA reinstated the match in 2007 and subsequently joined the San Francisco Match in 2008. Every orthopaedic surgical subspecialty now participates in an organized match process. With the exception of the hand (who uses National Resident Matching Program for a multidisciplinary match involving orthopaedic, plastic, and general surgery residents), the specialty societies use the San Francisco Match to run the fellowship match.

Applying to fellowship is akin to applying for residency. It takes time, money, and creates anxiety. With most specialties having more applicants than positions, the process is competitive for applicants and programs alike. There have been articles published on the match process describing the applicants’ and programs’ experiences. There has not been any literature on the optimal interview day experience. This experience can have an impact on the match results for both the program and the applicant.

The OTA has surveyed both the applicants and programs after the Match. The OTA PostMatch Survey in 2017 added questions to evaluate the interview experience. A summary of the PostMatch Survey results on optimizing the interview experience is presented below.

How Does the Interview Day Affect an Applicant’s Rank List?

The quality of interview day is a major factor that determines a program’s position on an applicant’s rank list. The 2017 OTA survey showed that for 30% of trauma fellowship applicants, a high-quality interview automatically placed a program in the top 3 of their rank list. For 62% of applicants, a high-quality interview raised a program on their list, but did not automatically place the program in the top 3. The following sections will describe the do’s and don’ts for interview days in the eyes of the fellowship applicant.

What Features Make Interview Days Less Effective?

The following items are a list of the negative experiences that made interview days less desirable in the eyes of the fellowship applicants. This list was compiled from a postmatch survey administered to the 2017 match class. For the programs, avoiding these pitfalls will likely lead to an interview experience that is better received by applicants and may lead to improved results in the match.

Unorganized Coordinator

Be sure that the program coordinator is well organized and replies to emails and phone calls in a timely fashion. This seems obvious, but several coordinators were not reachable. These programs tended to have unorganized interview days.

Few Faculty Members Present

Have as many faculty members present for interviews as possible. Meeting only 1 or 2 faculty members tended to drop programs on rank lists. The fellowship director especially should be present for the interview day.

Interviews Between Cases

Have time set aside for faculty to interview. Several sites would have applicants interview between operating room cases. This led to long waits, short interviews, and a generally poor experience.

Large Groups of Applicants

Interview days with more than 10 applicants were negatively received. These interview days tended to be very long and impersonal.

Group Interviews

Group interviews, while efficient for the faculty, were negatively received by many applicants. This style of interviewing makes it difficult for applicants to get to know individual faculty members and assess their fit with a program. In addition, this meant that applicants were spending large sums of money and time for what ended up being less than 15 minutes of interview time.
Lack of Provided Schedule and Details
Having a clear and accurate schedule (including time of interview and end time) given to applicants was very helpful. This allowed applicants to better coordinate their travel and save time away from work and money as a result.

Extensive Tours
Extensive hospital tours were generally unhelpful. Applicants would much rather spend time meeting faculty and current fellows than touring the hospital.

Night of Interview Social Events
Having social events the night of the interview typically led to an extra hotel night and an additional missed day of work for travel. Social events should be scheduled the night before the interview and should be optional.

Pimp Session
High pressure questioning of the applicants was a feature that tended to make interviews less enjoyable. Remember, the fellowship year will teach them what they need to know.

Meal Plans
Let the applicants know if breakfast will be served, or if they need to eat in advance. Going to an interview on an empty stomach and not being able to eat until the afternoon or evening makes for a poor experience.

What Features Make Interview Days More Effective?
An organized interview experience where the applicant feels as though they have an opportunity to meet with the faculty and fellow is important. In the 2017 PostMatch Survey, the applicants responded that the top 4 most important aspects of the interview day were meeting with the faculty, meeting with current fellows, providing an overview of the program on the day of the interview, and the program’s interview day level of efficiency and organization. OTA information session, meeting residents, and a facility tour were ranked as the least important. These rankings will be expanded on below.

Meeting Faculty
Seventy-eight percent of survey participants rated meeting faculty as the most important feature of interview days. An additional 14% ranked it as the second most important feature. Applicants want to meet as many faculty members as possible. Generally, they would like to have one-on-one interviews of at least 10 minutes. When you think about it, that is such a little amount of time for someone to make a decision that impacts their career.

Meeting Current Fellows
Sixteen percent of survey participants rated meeting current fellows as the most important feature of interview days. An additional 43% ranked it as the second most important feature and 19% ranked it third. For applicants, fellows provide an unbiased overview of the program. Fellows are typically willing to openly discuss their experience including both positives and negatives. Applicants generally wanted the fellow to have time set aside to talk during every interview day. In addition, providing contact information for previous fellows is quite helpful.

Overview of Program on Interview Day
An overview of the program is helpful to set the tone for the interview and provide a background to the applicants to ask questions. Reviewing the practice sites, faculty, rotations (if applicable), clinical and research expectations, call schedule etc are all useful for inclusion. Three percent of survey participants rated the program overview as the most important feature of interview days. In addition, 8% ranked it as the second most important feature, 30% ranked it third, and 27% ranked it fourth. During this time, having access or reviewing the fellow’s case logs is also quite helpful. Typically, case logs and unique features of each program were covered in these talks.

Efficiency and Organization
Although 0% (if it is zero—just state none) of survey participants rated efficiency and organization as the most important feature of interview days, 16% ranked it as the second most important feature, 24% ranked it third, 14% ranked it fourth, and 24% ranked it fifth. As stated above, organized interview days made applicants feel valued, and a positive interview day is a thought to be reflection of the fellowship year.

The Bottom Line for Program Directors
The interview day is important. It is like the first date, if they are not impressed, they will not be ranking you highly. A lot more effort goes into residency interview days, whereas for fellowships many programs simply invite applicants and make it work the day of the interview without much foresight and planning. We encourage you to think about this day and make it count. Applicants want reserved time with the faculty and to feel that the faculty know something about them before they come. An effort should be made to prepare for the interview for fellowship like we do for residency.

What Applicants Want
1. Receive an interview day schedule in advance
2. Talk to the faculty individually
3. Talk to the fellow(s)
4. Receive a program overview presentation
5. Be organized
6. Case logs from previous fellows
7. Show examples of cases the fellow takes part in without asking pimp questions

Tips for the Fellowship Applicant
Applying for fellowship match can be a time consuming, stressful, and expensive enterprise. These negative experiences can be amplified if you are unfamiliar with the current interview and match process. To help guide you through this time in your career, the following tips were compiled from previous fellowship applicants. Following
these tips will hopefully make fellowship match easier and more efficient for every applicant.

**Research Programs Early**
Do your research on programs and complete your application before the OTA annual meeting. Most programs do meet and greets, and a few do interviews at this meeting. The meet and greets/information sessions may affect your decision on whether or not you want to interview at a program if offered. These events are useful for prospective fellows to attend.

**Be Selective When Registering for the Annual Meeting**
When attending the OTA annual meeting, it is important to be selective in which events you pay to attend. The fellowship “Meet and greets” and interviews are extensive and run continuously for the first 3 days of the meeting. You may pay for a session that you are subsequently unable to attend due to other obligations.

**Save Money**
Applicants typically spend between $4000 and $8000 throughout the interview process.

**Make Travel as Efficient as Possible**
Getting Transportation Security Administration pre-check will help streamline your travel and make it easier to catch flights close to your interview times.

**Pick an Airline**
Select a single airline and join their rewards program. You can typically earn a free flight during the interview process. Certain airlines have high change fees for altering your travel plans or if you would get stuck somewhere. Pay attention to airline rules when making reservations. In addition, using a single credit card with rewards for use can help you in the end getting free flights, hotels, or taking a noninterview trip!

**Do Not Apply Too Broadly**
Generally, applying to 15–20 programs and accepting 10 interviews is sufficient to match.

**Ask Specific Questions**
Know the features that you are looking for in a program before interviews begin. Make sure you ask specific questions and write down the answers of each program for later review.

**Make Friends**
Get to know your coapplicants and share contact information at the OTA annual meeting and on the interview trail. These people will be your colleagues and you will see them routinely for the rest of your career.

**Know What You Are Looking for**
Fit is everything. Know what you are looking for and trust your gut when making a rank list. The perfect program for you may be the lowest program on another applicant’s list.

**Go for Overall Fit**
Remember, the program may change if key faculty leave. Do not choose a program just for 1 faculty member. Choose a program based on the fit, your goals, and the overall fellowship experience offered.

**CONCLUSIONS**
The interview experience for applicants and programs varies. Considering the amount of time, effort, and the financial burden of the fellowship interview process, we believed this could provide valuable information as to what constitutes an ideal interview experience.
Resident Assembly Advisory Opinion #2

State Main Purpose/Title
Propose Legislative Action to Allow for Physician Extender Reimbursement when both Resident Physicians and Physician Extenders are Assisting in Operations.

Resident’s Name
Eric M. Kiskaddon

Residency Program
Wright State University

Are you a Resident Delegate?
Yes

Classification of Proposed AO
(To the AAOS, to the RA or Other)
AAOS

WHEREAS:
Physician extenders (PA’s and NP’s) have been shown in several studies to benefit workflow in the academic setting [1,2] With the ACGME required reductions in resident work hours, the number of physician extender hires and overall cost to the healthcare system has increased. [3,4]

WHEREAS:
Under CMS guidelines, surgeons can bill for the services of physician extenders in surgical cases where no qualified resident is “available” by utilizing modifier 82. This allows for reimbursement up to 85% of the 16% assistant surgeon fee. [5]

WHEREAS:
However, surgeons cannot bill for the services of a physician extender when a resident is present unless they utilize modifiers AS 80 or 81, which suspends the claim until the case has been reviewed and deemed an exceptional circumstance.[5]

WHEREAS:
In many orthopaedic residency programs, this financial incentive has resulted in faculty utilizing the services of physician extenders in lieu of residents in the operating room. Subsequently, the quality of resident surgical education has suffered.

WHEREAS:
For the welfare of future generations of patients who will benefit from well trained resident physicians, the federal government should not disincentivize the education of residents with legislation such as currently exists.

RESOLVED A:
That the AAOS Resident Assembly Health Policy Committee develop and distribute a survey that looks at the impacts of the physician extender policy as it affects resident training.

RESOLVED B:
That the AAOS Council on Advocacy, with assistance from the Resident Assembly Health Policy Committee as necessary, review the results from the survey regarding the implications on residency training from existing legislation on physician extender reimbursement when both a resident and physician extender are present in the operating room, and determine what further action is required.
REFERENCES:

Advanced Practice Registered Nurses, Anesthesiologist Assistants, and Physician Assistants
Please note: The information in this publication applies only to the Medicare Fee-For-Service Program (also known as Original Medicare).

Table 2. Hyperlink Table, at the end of this document, provides the complete URL for each hyperlink.

<table>
<thead>
<tr>
<th>Supplier Chart</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPLIER CHARTS</td>
<td>3</td>
</tr>
<tr>
<td>CERTIFIED REGISTERED NURSE ANESTHETISTS (CRNAs)</td>
<td>4</td>
</tr>
<tr>
<td>ANESTHESIOLOGIST ASSISTANTS (AAs)</td>
<td>6</td>
</tr>
<tr>
<td>NURSE PRACTITIONERS (NPs)</td>
<td>8</td>
</tr>
<tr>
<td>CERTIFIED NURSE-MIDWIVES (CNMs)</td>
<td>10</td>
</tr>
<tr>
<td>CLINICAL NURSE SPECIALISTS (CNSs)</td>
<td>12</td>
</tr>
<tr>
<td>PHYSICIAN ASSISTANTS (PAs)</td>
<td>14</td>
</tr>
<tr>
<td>ENROLLING IN THE MEDICARE PROGRAM</td>
<td>16</td>
</tr>
<tr>
<td>RESOURCES</td>
<td>17</td>
</tr>
</tbody>
</table>
The supplier charts provide information on the required qualifications, coverage criteria, billing, and payment for Medicare services furnished by certified registered nurse anesthetists (CRNAs), anesthesiologist assistants (AAs), nurse practitioners (NPs), certified nurse-midwives (CNMs), clinical nurse specialists (CNSs), and physician assistants (PAs). Advanced practice registered nurses include CRNAs, NPs, CNMs, and CNSs.

Each supplier type is color coded to assist you in finding information of interest.
CERTIFIED REGISTERED NURSE ANESTHETISTS (CRNAs)

When “you” is used in these charts, we are referring to CRNAs.

<table>
<thead>
<tr>
<th>Required Qualifications for CRNAs</th>
<th>Coverage Criteria for CRNAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>You must:</td>
<td>These coverage criteria apply:</td>
</tr>
<tr>
<td>- Be licensed as a registered professional nurse by the State where you practice</td>
<td>- You are legally authorized and qualified to furnish the services in the State where you perform such services</td>
</tr>
<tr>
<td>- Meet any licensure requirements the State imposes with respect to non-physician anesthetists</td>
<td>- Services are not otherwise precluded due to a statutory exclusion, and the services must be reasonable and necessary[1]</td>
</tr>
<tr>
<td>- Have graduated from a nurse anesthesia educational program that meets the standards of the Council on Accreditation of Nurse Anesthesia Programs</td>
<td>- When anesthesia is administered in a hospital, you must be under the supervision of the operating practitioner performing the procedure or of an anesthesiologist who is immediately available if needed, unless you are located in a State that has opted out of the supervision requirements[2]</td>
</tr>
<tr>
<td>- Meet one of these criteria:</td>
<td>- When anesthesia is administered in a Critical Access Hospital or Ambulatory Surgical Center (ASC), you must be under the supervision of the operating practitioner performing the procedure, unless you are located in a State that has opted out of the supervision requirements</td>
</tr>
<tr>
<td>- Have passed a certification examination of the Council on Certification of Nurse Anesthetists or the Council on Recertification of Nurse Anesthetists</td>
<td></td>
</tr>
<tr>
<td>- Have graduated from one of the nurse anesthesia educational programs that meets the standards of the Council on Accreditation of Nurse Anesthesia Programs and passed the above certification examination within 24 months of graduation</td>
<td></td>
</tr>
</tbody>
</table>

[1] Services must meet specific medical necessity requirements contained in the statute, regulations, and manuals and specific medical necessity criteria defined by National Coverage Determinations and Local Coverage Determinations (if any exist for the service you are reporting). For every service billed, you must indicate the specific sign, symptom, or patient complaint that makes the service reasonable and necessary.

[2] An anesthesiologist is considered immediately available when he or she is:
   - Physically located within the same area as the CRNA.
   - Not otherwise occupied in a way that prevents an immediate hands-on intervention.
**CERTIFIED REGISTERED NURSE ANESTHETISTS (CRNAs) (cont.)**

### Billing Guidelines for CRNAs
- These billing guidelines apply:
  - You may bill the Medicare Program either:
    - Directly for services using your National Provider Identifier (NPI) or
    - Under the NPI of a hospital, physician, group practice, or ASC with which you have an employment or contractual relationship
  - Anesthesia time is the continuous period that:
    - Begins when the patient is prepared for anesthesia services in the operating room or equivalent area
    - Ends when the patient may be placed safely under postoperative care
  - Blocks of time can be added around an interruption in anesthesia time as long as continuous anesthesia care is furnished within the time periods around the interruption
  - Anesthesia billing modifiers include:
    - QS – Monitored anesthesia care service
    - QY – Medical direction of one certified registered nurse anesthetist by an anesthesiologist
    - QZ – CRNA service: without medical direction by a physician
    - QX – CRNA service: with medical direction by a physician

### Payment Guidelines for CRNAs
- These payment guidelines apply:
  - Payment is made only on assignment basis[3]
  - Payment is subject to Medicare Part B deductible and coinsurance
  - Services are paid under the Anesthesia Fee Schedule at the lesser of 80% of one of these:
    - The actual charge
    - The applicable CRNA conversion factor (CF) multiplied by the sum of allowable base and time units
    - The applicable locality of the participating anesthesiologist’s CF multiplied by the sum of allowable base and time units
  - One anesthesia time unit = 15 minutes of anesthesia time

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[3] Assignment means that the provider or supplier:
- Will be paid the Medicare-allowed amount as payment in full for his or her services.
- May not bill or collect from the patient any amount other than unmet copayments, deductibles, and/or coinsurance.
**ANESTHESIOLOGIST ASSISTANTS (AAs)**

When “you” is used in these charts, we are referring to AAs.

<table>
<thead>
<tr>
<th>Required Qualifications for AAs</th>
<th>Coverage Criteria for AAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>You must:</td>
<td>These coverage criteria apply:</td>
</tr>
<tr>
<td>◦ Work under the direction of an anesthesiologist</td>
<td>◦ You are legally authorized and qualified to furnish the services in the State where you perform such services</td>
</tr>
<tr>
<td>◦ Be in compliance with all applicable requirements of State law, including any licensure requirements the State imposes on non-physician anesthetists</td>
<td>◦ Services are not otherwise precluded due to a statutory exclusion, and the services must be reasonable and necessary[1]</td>
</tr>
<tr>
<td>◦ Have graduated from a medical school-based AA education program that:</td>
<td>◦ When anesthesia is administered in a hospital, you must be under the supervision of an anesthesiologist who is immediately available if needed[2]</td>
</tr>
<tr>
<td>- Is accredited by the Committee on Allied Health Education and Accreditation</td>
<td>◦ When anesthesia is administered in a Critical Access Hospital or Ambulatory Surgical Center (ASC), you must be under the supervision of an anesthesiologist</td>
</tr>
<tr>
<td>- Includes approximately 2 years of specialized science and clinical education in anesthesia at a level that builds on a premedical undergraduate science background</td>
<td><strong>[1]</strong> Services must meet specific medical necessity requirements contained in the statute, regulations, and manuals and specific medical necessity criteria defined by National Coverage Determinations and Local Coverage Determinations (if any exist for the service you are reporting). For every service billed, you must indicate the specific sign, symptom, or patient complaint that makes the service reasonable and necessary.</td>
</tr>
<tr>
<td><strong>[2]</strong> An anesthesiologist is considered immediately available when he or she is:</td>
<td>◦ Physically located within the same area as the AA.</td>
</tr>
<tr>
<td>- Physically located within the same area as the AA.</td>
<td></td>
</tr>
<tr>
<td>- Not otherwise occupied in a way that prevents an immediate hands-on intervention.</td>
<td>◦ Not otherwise occupied in a way that prevents an immediate hands-on intervention.</td>
</tr>
</tbody>
</table>
**Billing Guidelines for AAs**

- These billing guidelines apply:
  - You may bill the Medicare Program either:
    - Directly for services using your National Provider Identifier (NPI) or
    - Under the NPI of a hospital, physician, group practice, or ASC with which you have an employment or contractual relationship
  - Anesthesia time is the continuous period that:
    - Begins when the patient is prepared for anesthesia services in the operating room or equivalent area
    - Ends when the patient may be placed safely under postoperative care
  - Blocks of time can be added around an interruption in anesthesia time as long as continuous anesthesia care is furnished within the time periods around the interruption
  - Anesthesia billing modifiers include:
    - QS – Monitored anesthesia care service
    - QY – Medical direction of one certified registered nurse anesthetist by an anesthesiologist
    - QZ – CRNA service: without medical direction by a physician
    - QX – CRNA service: with medical direction by a physician

---

**Payment Guidelines for AAs**

- These payment guidelines apply:
  - Payment is made only on assignment basis[3]
  - Payment is subject to Medicare Part B deductible and coinsurance
  - Services are paid under the Anesthesia Fee Schedule at the lesser of 80% of one of these:
    - The actual charge
    - The applicable CRNA conversion factor (CF) multiplied by the sum of allowable base and time units
    - The applicable locality of the participating anesthesiologist’s CF multiplied by the sum of allowable base and time units
  - One anesthesia time unit = 15 minutes of anesthesia time

---

[3] Assignment means that the provider or supplier:
- Will be paid the Medicare-allowed amount as payment in full for his or her services.
- May not bill or collect from the patient any amount other than unmet copayments, deductibles, and/or coinsurance.
# NURSE PRACTITIONERS (NPs)

When “you” is used in these charts, we are referring to NPs.

## Required Qualifications for NPs

- You must:
  - Be a registered professional nurse authorized by the State in which you furnish services to practice as a NP in accordance with State law and meet one of these criteria:
    - Have obtained Medicare billing privileges as a NP for the first time on or after January 1, 2003, and
    - Are certified as a NP by a recognized national certifying body that has established standards for NPs
    - Have a Master's degree in nursing or a Doctor of Nursing Practice degree
  - Have obtained Medicare billing privileges as a NP for the first time before January 1, 2003, and meet the certification requirements described above or
  - Have obtained Medicare billing privileges as a NP for the first time before January 1, 2001

## Coverage Criteria for NPs

- These coverage criteria apply:
  - You are legally authorized and qualified to furnish the services in the State where you perform such services
  - Services are not otherwise precluded due to a statutory exclusion, and the services must be reasonable and necessary[1]
  - Services are the type considered physicians’ services if furnished by a medical doctor or a doctor of osteopathy
  - Services are performed in collaboration with a physician[4]
  - Assistant-at-surgery services furnished by a NP may be covered
  - Incident to services and supplies may be covered[5]

---

[1] Services must meet specific medical necessity requirements contained in the statute, regulations, and manuals and specific medical necessity criteria defined by National Coverage Determinations and Local Coverage Determinations (if any exist for the service you are reporting). For every service billed, you must indicate the specific sign, symptom, or patient complaint that makes the service reasonable and necessary.

[4] Collaboration occurs when NPs and CNSs:
- Work with one or more physicians to deliver health care services within the scope of their professional expertise.
- Medical direction and appropriate supervision is provided as required by the law of the State in which the services are furnished (it is not required for the collaborating physician to be present when services are furnished or to independently evaluate patients).

[5] Physicians, NPs, CNMs, CNSs, and PAs may have services and supplies furnished incident to their professional service. NPs, CNMs, CNSs, and PAs may enroll in and obtain payment from Medicare for incident to services they furnish and for services that other non-physician practitioners (NPPs) furnish incident to their own professional services. To be covered and paid under the Incident to Provision, the services and supplies must be furnished in compliance with State law and all of these requirements must be met:
- Services and supplies must be an integral part of the patient’s normal course of treatment during which the physician or other listed practitioner has personally performed an initial service and remains actively involved in the course of treatment.
- Services and supplies are commonly furnished without charge or included in the physician’s or other listed practitioner’s bill.
- Services and supplies are an expense to the physician or other listed practitioner.
- Services and supplies are commonly furnished in the physician’s or other listed practitioner’s office or clinic.
- Services and supplies must be furnished in accordance with applicable State law.
- The physician or other listed practitioner provides direct supervision for incident to services, and only the physician or other listed practitioner who directly supervises the incident to services may bill for such services.
- For services and supplies furnished incident to Transitional Care Management (TCM) and Chronic Care Management (CCM) services by clinical staff, general supervision is required by the physician or other listed practitioner. However, only the supervising physician or other listed practitioner may bill Medicare for services and supplies furnished incident to TCM and CCM services.
### Billing Guidelines for NPs

- These billing guidelines apply:
  - You may either:
    - Bill the Medicare Program directly for services using your National Provider Identifier (NPI) or
    - Have an employer or contractor bill for your services using your NPI for reassigned payment
  - A supervising physician must bill under his or her NPI for services you furnish incident to the physician’s professional services
  - You must bill under your NPI for services furnished incident to your own professional services

### Payment Guidelines for NPs

- These payment guidelines apply:
  - Payment is made only on assignment basis[3]
  - Services are paid at 85% of the amount a physician is paid under the Medicare Physician Fee Schedule (PFS)
  - Payment is made directly to the NP for assistant-at-surgery services at 85% of 16% of the amount a physician is paid under the Medicare PFS for assistant-at-surgery services
  - Payment for services furnished incident to the services of a NP in a setting outside of a hospital is made to the NP at 85% of the amount a physician is paid under the Medicare PFS
  - When you bill directly for services furnished to hospital inpatients and outpatients, payment is unbundled and made to the NP

---

[3] Assignment means that the provider or supplier:
- Will be paid the Medicare-allowed amount as payment in full for his or her services.
- May not bill or collect from the patient any amount other than unmet copayments, deductibles, and/or coinsurance.
## CERTIFIED NURSE-MIDWIVES (CNMs)

When “you” is used in these charts, we are referring to CNMs.

### Required Qualifications for CNMs

- You must:
  - Be a registered professional nurse who is legally authorized to practice as a nurse-midwife in the State in which you perform services
  - Have successfully completed a program of study and clinical experience for nurse-midwives that is accredited by an accrediting body approved by the United States Department of Education
  - Be certified as a nurse-midwife by the American College of Nurse-Midwives or the American College of Nurse-Midwives Certification Council

### Coverage Criteria for CNMs

- These coverage criteria apply:
  - You are legally authorized and qualified to furnish the services in the State where you perform such services
  - Services are not otherwise precluded due to a statutory exclusion, and the services must be medically reasonable and necessary[^1]
  - Services are the type considered physicians’ services if furnished by a medical doctor or a doctor of osteopathy
  - Services are performed without physician supervision and without association with a physician or health care provider, unless otherwise required by State law
  - Services are covered in all settings including:
    - Offices
    - Clinics
    - Birthing centers
    - Patients’ homes
    - Hospitals
  - Incident to services and supplies may be covered[^5]

[^1]: Services must meet specific medical necessity requirements contained in the statute, regulations, and manuals and specific medical necessity criteria defined by National Coverage Determinations and Local Coverage Determinations (if any exist for the service you are reporting). For every service billed, you must indicate the specific sign, symptom, or patient complaint that makes the service reasonable and necessary.

[^5]: Physicians, NPs, CNMs, CNSs, and PAs may have services and supplies furnished incident to their professional service. NPs, CNMs, CNSs, and PAs may enroll in and obtain payment from Medicare for incident to services they furnish and for services that other NPPs furnish incident to their own professional services. To be covered and paid under the Incident to Provision, the services and supplies must be furnished in compliance with State law and all of these requirements must be met:
  - Services and supplies must be an integral part of the patient’s normal course of treatment during which the physician or other listed practitioner has personally performed an initial service and remains actively involved in the course of treatment.
  - Services and supplies are commonly furnished without charge or included in the physician’s or other listed practitioner’s bill.
  - Services and supplies are an expense to the physician or other listed practitioner.
  - Services and supplies are commonly furnished in the physician’s or other listed practitioner’s office or clinic.
  - Services and supplies must be furnished in accordance with applicable State law.
  - The physician or other listed practitioner provides direct supervision for incident to services, and only the physician or other listed practitioner who directly supervises the incident to services may bill for such services.
  - For services and supplies furnished incident to Transitional Care Management (TCM) and Chronic Care Management (CCM) services by clinical staff, general supervision is required by the physician or other listed practitioner. However, only the supervising physician or other listed practitioner may bill Medicare for services and supplies furnished incident to TCM and CCM services.
CERTIFIED NURSE-MIDWIVES (CNMs) (cont.)

### Billing Guidelines for CNMs

- These billing guidelines apply:
  - You may either:
    - Bill the Medicare Program directly for services using your National Provider Identifier (NPI) or
    - Have an employer or contractor bill for your services using your NPI for reassigned payment
  - A supervising physician must bill under his or her NPI for services you furnish incident to the physician's professional services
  - You must bill under your NPI for services furnished incident to your own professional services
  - Use billing modifier 52 to report that all services covered by the global allowance were not provided by the billing provider (should not be used when billing for split/shared evaluation and management visits)

### Payment Guidelines for CNMs

- These payment guidelines apply:
  - Payment is made only on assignment basis[3]
  - Services are paid at 80% of the lesser of the actual charge or 100% of the amount a physician is paid under the Medicare Physician Fee Schedule (PFS)
  - Payment for services furnished incident to the services of a CNM in a setting outside of a hospital is made to the CNM at 100% of the amount a physician is paid under the Medicare PFS
  - When you bill directly for services furnished to hospital inpatients and outpatients, payment is unbundled and made to you
  - When you provide most of a global service and call in the physician to provide a portion of the care or when the physician provides most of the service and calls you in, payment is based on the portion of the global fee that would have been paid to the other provider

---

[3] Assignment means that the provider or supplier:
- Will be paid the Medicare-allowed amount as payment in full for his or her services.
- May not bill or collect from the patient any amount other than unmet copayments, deductibles, and/or coinsurance.
### CLINICAL NURSE SPECIALISTS (CNSs)

When “you” is used in these charts, we are referring to CNSs.

#### Required Qualifications for CNSs

- You must:
  - Be a registered nurse currently licensed to practice in the State where you practice and authorized to furnish the services of a CNS in accordance with State law
  - Have a Doctor of Nursing Practice or a Master’s degree in a defined clinical area of nursing from an accredited educational institution
  - Be certified as a CNS by a recognized national certifying body that has established standards for CNSs

#### Coverage Criteria for CNSs

- These coverage criteria apply:
  - You are legally authorized and qualified to furnish the services in the State where you perform such services
  - Services are not otherwise precluded due to a statutory exclusion, and the services must be reasonable and necessary[1]
  - Services are the type considered physicians’ services if furnished by a medical doctor or a doctor of osteopathy
  - Services are performed in collaboration with a physician[4]
  - Assistant-at-surgery services furnished by a CNS may be covered
  - Incident to services and supplies may be covered[5]

---

[1] Services must meet specific medical necessity requirements contained in the statute, regulations, and manuals and specific medical necessity criteria defined by National Coverage Determinations and Local Coverage Determinations (if any exist for the service you are reporting). For every service billed, you must indicate the specific sign, symptom, or patient complaint that makes the service reasonable and necessary.

[4] Collaboration occurs when NPs and CNSs:
- Work with one or more physicians to deliver health care services within the scope of their professional expertise.
- Medical direction and appropriate supervision is provided as required by the law of the State in which the services are furnished (it is not required for the collaborating physician to be present when services are furnished or to independently evaluate patients).

[5] Physicians, NPs, CNMs, CNSs, and PAs may have services and supplies furnished incident to their professional service. NPs, CNMs, CNSs, and PAs may enroll in and obtain payment from Medicare for incident to services they furnish and for services that other NPPs furnish incident to their own professional services. To be covered and paid under the Incident to Provision, the services and supplies must be furnished in compliance with State law and all of these requirements must be met:
- Services and supplies must be an integral part of the patient’s normal course of treatment during which the physician or other listed practitioner has personally performed an initial service and remains actively involved in the course of treatment.
- Services and supplies are commonly furnished without charge or included in the physician’s or other listed practitioner’s bill.
- Services and supplies are an expense to the physician or other listed practitioner.
- Services and supplies are commonly furnished in the physician’s or other listed practitioner’s office or clinic.
- Services and supplies must be furnished in accordance with applicable State law.
- The physician or other listed practitioner provides direct supervision for incident to services, and only the physician or other listed practitioner who directly supervises the incident to services may bill for such services.
- For services and supplies furnished incident to Transitional Care Management (TCM) and Chronic Care Management (CCM) services by clinical staff, general supervision is required by the physician or other listed practitioner. However, only the supervising physician or other listed practitioner may bill Medicare for services and supplies furnished incident to TCM and CCM services.
### Billing Guidelines for CNSs

- These billing guidelines apply:
  - You may bill the Medicare Program:
    - Directly for services using your National Provider Identifier (NPI) or
    - Have an employer or contractor bill for CNS services using your NPI for reassigned payment
  - A supervising physician must bill under his or her NPI for services you furnish incident to the physician's professional services
  - You must bill under your NPI for services that are furnished incident to your own professional services

### Payment Guidelines for CNSs

- These payment guidelines apply:
  - Payment is made only on assignment basis\[3\]
  - Services are paid directly to the CNS at 85% of the amount a physician is paid under the Medicare Physician Fee Schedule (PFS)
  - Payment is made directly to the CNS for assistant-at-surgery services at 85% of 16% of the amount a physician is paid under the Medicare PFS for assistant-at-surgery services
  - Payment for services furnished incident to the services of a CNS in a setting outside of a hospital is made to the CNS at 85% of the amount a physician is paid under the Medicare PFS
  - When you bill directly for services furnished to hospital inpatients and outpatients, payment is unbundled and made to the CNS

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\[3\] Assignment means that the provider or supplier:

- Will be paid the Medicare-allowed amount as payment in full for his or her services.
- May not bill or collect from the patient any amount other than unmet copayments, deductibles, and/or coinsurance.
PHYSICIAN ASSISTANTS (PAs)

When “you” is used in these charts, we are referring to PAs.

**Required Qualifications for PAs**

- You must:
  - Be licensed by the State to practice as a PA and meet one of these criteria:
    - Have graduated from a PA educational program accredited by the Accreditation Review Commission on Education for the Physician Assistant (its predecessor agencies, the Commission on Accreditation of Allied Health Education Programs, and the Committee on Allied Health Education and Accreditation) or
    - Have passed the national certification examination administered by the National Commission on Certification of Physician Assistants

**Coverage Criteria for PAs**

- These coverage criteria apply:
  - You are legally authorized and qualified to furnish the services in the State where you perform such services
  - Services are not otherwise precluded due to a statutory exclusion, and the services must be reasonable and necessary
  - Services are the type considered physician’s services if furnished by a medical doctor or a doctor of osteopathy
  - Services are performed by an individual who meets all PA qualifications
  - Services are performed under the general supervision of a medical doctor or a doctor of osteopathy
  - The physician supervisor or designee need not be physically present when a service is being furnished and can be contacted by telephone unless State law or regulations require otherwise
  - Assistant-at-surgery services furnished by a PA may be covered
  - Incident to services and supplies may be covered

[1] Services must meet specific medical necessity requirements contained in the statute, regulations, and manuals and specific medical necessity criteria defined by National Coverage Determinations and Local Coverage Determinations (if any exist for the service you are reporting). For every service billed, you must indicate the specific sign, symptom, or patient complaint that makes the service reasonable and necessary.

[5] Physicians, NPs, CNMs, CNSs, and PAs may have services and supplies furnished incident to their professional service. NPs, CNMs, CNSs, and PAs may enroll in and obtain payment from Medicare for incident to services they furnish and for services that other NPPs furnish incident to their own professional services. To be covered and paid under the Incident to Provision, the services and supplies must be furnished in compliance with State law and all of these requirements must be met:
- Services and supplies must be an integral part of the patient’s normal course of treatment during which the physician or other listed practitioner has personally performed an initial service and remains actively involved in the course of treatment.
- Services and supplies are commonly furnished without charge or included in the physician’s or other listed practitioner’s bill.
- Services and supplies are an expense to the physician or other listed practitioner.
- Services and supplies are commonly furnished in the physician’s or other listed practitioner’s office or clinic.
- Services and supplies must be furnished in accordance with applicable State law.
- The physician or other listed practitioner provides direct supervision for incident to services, and only the physician or other listed practitioner who directly supervises the incident to services may bill for such services.
- For services and supplies furnished incident to Transitional Care Management (TCM) and Chronic Care Management (CCM) services by clinical staff, general supervision is required by the physician or other listed practitioner. However, only the supervising physician or other listed practitioner may bill Medicare for services and supplies furnished incident to TCM and CCM services.
PHYSICIAN ASSISTANTS (PAs) (cont.)

**Billing Guidelines for PAs**

<table>
<thead>
<tr>
<th>These billing guidelines apply when billing the Medicare program for PA services:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your W-2 employer or 1099 independent contractor must bill under your National Provider Identifier (NPI)</td>
</tr>
<tr>
<td>You cannot reassign payment for your services; therefore, your employer or contractor cannot bill for reassigned services</td>
</tr>
<tr>
<td>A supervising physician must bill under his or her NPI for services you furnish incident to the physician’s professional services</td>
</tr>
<tr>
<td>Your employer or contractor must bill under your NPI for services furnished incident to your professional services</td>
</tr>
</tbody>
</table>

**Payment Guidelines for PAs**

<table>
<thead>
<tr>
<th>These payment guidelines apply:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payment is made only on assignment basis[3]</td>
</tr>
<tr>
<td>Payment may be made only to his or her:</td>
</tr>
<tr>
<td>• Qualified employer who is eligible to enroll in the Medicare Program under existing provider/supplier categories</td>
</tr>
<tr>
<td>• Contractor</td>
</tr>
<tr>
<td>Services are paid at 85% of the amount a physician is paid under the Medicare Physician Fee Schedule (PFS)</td>
</tr>
<tr>
<td>Payment is made to the PA’s employer or contractor for assistant-at-surgery services at 85% of 16% of the amount a physician is paid under the Medicare PFS for assistant-at-surgery services</td>
</tr>
<tr>
<td>Payment for services furnished incident to the services of a PA in a setting outside of a hospital is made to the employer or contractor of a PA at 85% of the amount a physician is paid under the Medicare PFS</td>
</tr>
</tbody>
</table>

---

[3] Assignment means that the provider or supplier:  
- Will be paid the Medicare-allowed amount as payment in full for his or her services.  
- May not bill or collect from the patient any amount other than unmet copayments, deductibles, and/or coinsurance.
APRNs, AAs, and PAs who care for Medicare patients must enroll in the Medicare Program. You must enroll regardless of whether you are a participating provider or you bill services under your NPI or the supervising physician’s NPI. To enroll in and obtain payment from Medicare, you must apply for a NPI and enrollment in the Medicare Program.
**RESOURCES**

Table 1 provides resource information on services furnished by APRNs, AAs, and PAs.

**Table 1. Resource Information on Services Furnished by APRNs, AAs, and PAs**

<table>
<thead>
<tr>
<th>For More Information About…</th>
<th>Resource</th>
</tr>
</thead>
</table>
| Services Furnished by APRNs, AAs, and PAs | CMS.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLN Products/APNPA.html  
| Enrolling in the Medicare Program | CMS.gov/Medicare/Provider-Enrollment-and-Certification/MedicareProvider SupEnroll |
| All Available Medicare Learning Network® Products | MLN Catalog |
| Provider-Specific Medicare Information | MLN Guided Pathways: Provider Specific Medicare Resources |
| Medicare Information for Patients | Medicare.gov |

**Table 2. Hyperlink Table**

<table>
<thead>
<tr>
<th>Embedded Hyperlink</th>
<th>Complete URL</th>
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</thead>
</table>
Musculoskeletal Workforce Needs: Are Physician Assistants and Nurse Practitioners the Solution?

Charles S. Day, MD, MBA, Scott D. Boden, MD, Patrick T. Knott, PhD, PA-C, Nancy C. O’Rourke, MSN, ACNP, ANP, FAANP, and Brian W. Yang, BA

Abstract: Growth estimates and demographic shifts of the population of the United States foreshadow a future heightened demand for musculoskeletal care. Although many articles have discussed this growing demand on the musculoskeletal workforce, few address the inevitable need for more musculoskeletal care providers. As we are unable to increase the number of orthopaedic surgeons because of restrictions on graduate medical education slots, physician assistants (PAs) and nurse practitioners (NPs) represent one potential solution to the impending musculoskeletal care supply shortage. This American Orthopaedic Association (AOA) symposium report investigates models for advanced practice provider integration, considers key issues affecting PAs and NPs, and proposes guidelines to help to assess the logistical and educational possibilities of further incorporating NPs and PAs into the orthopaedic workforce in order to address future musculoskeletal care needs.

Estimating the musculoskeletal (MSK) workforce need is a critically important but challenging topic. The population of the United States is growing, and some predictions suggest that it may reach 400 million by 2040. Moreover, the population at least 65 years of age will increase by 40% from 2010 to 2020, and to an estimated 70 million Americans by 2030. These growth estimates have led to estimates of increases in demand for MSK care of 30% from 2015 to 2020 and 50% from 2015 to 2030.

Although many articles have discussed the growing demand on the MSK workforce, few address the inevitable need for more MSK care providers. Physician assistants (PAs) and nurse practitioners (NPs) represent one potential solution to the impending supply shortage in the field. Because of the

Peer Review: This article was reviewed by the Editor-in-Chief and one Deputy Editor, and it underwent blinded review by two or more outside experts. The Deputy Editor reviewed each revision of the article, and it underwent a final review by the Editor-in-Chief prior to publication. Final corrections and clarifications occurred during one or more exchanges between the author(s) and copyeditors.

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relative stagnation in the growth of orthopaedic surgery residency positions, the rapid increase in the number of PAs and NPs may help to alleviate the growing MSK care demand as the over-65 population increases (Fig. 1)\(^\text{5-12}\). Although we know that the number of PA and NP practitioners working in the MSK environment has increased over the past decade, the routes that they took to that position and their exact roles in the clinics, practices, and operating rooms are unclear.

This AOA (American Orthopaedic Association) symposium report investigates the opportunities and challenges affecting whether orthopaedic surgeons and PA and NP MSK providers can more efficiently integrate with one another to address MSK workforce needs. To do so, we examine the top issues affecting each of these key stakeholders, with a particular emphasis on models of advanced practice provider (APP) integration as well as the APP MSK curriculum and training. Finally, it will be important to consider how to move forward as a profession as we continue to explore the nuances of integrating APPs into the MSK workforce.

Orthopaedic Surgeons and Models for APP Integration

With limited increases in the number of new medical schools and graduate medical education funding restrictions, the number of residency graduates has not kept pace with projected demand. As a result, the current state of orthopaedic surgery training may need to be reexamined. We should, at some point, ask whether it makes sense to train surgeons for 5 to 6 years to have them perform surgery only 40% to 50% of their clinical time. Might it be more efficient to have surgeons spend 80% of their week operating and to achieve peak technical proficiency sooner after entering practice? Will we create a shorter nonoperative orthopaedist training track or better collaborate with other specialties to produce the nonoperative MSK physicians of the future?

The answers to these questions remain unknown at present, but in any scenario, the role of APPs in MSK care delivery is likely to increase. Moreover, of all of the potential changes mentioned above, increasing the role of APPs is likely to be the change that can be most easily implemented. Indeed, \(>75\%\) of 44 orthopaedic surgeon respondents in our AOA symposium indicated that they currently employ a PA or NP in their practice, group, or department\(^\text{13}\). Assuming that orthopaedic surgeons will likely want to continue to assume the “organizer” role in integrated delivery models that address both nonoperative and surgical MSK issues, a key question is how to best integrate the APP into an MSK practice in the future.

Integration of an APP is typically achieved in an independent provider role or in a collaborative role. In the independent role, the provider evaluates and treats new patients independently of a physician and refers the patient to the appropriate physician when nonoperative treatment has been exhausted, when a diagnosis is not clear, or when the patient requests to see a physician. Currently, NPs can practice without physician supervision in 21 states while PAs require varying levels of physician supervision according to state law\(^\text{14,15}\). In this

![Percent change projections, from the baseline year of 2000, in the U.S. population at least 65 years of age, total numbers of PAs and NPs in the United States, and total number of orthopaedic surgery positions offered in the matching program. A linear regression trend line for each data set is shown.](image)
setting, APPs receive 85% of the fee schedule amount set for physicians as reimbursement\textsuperscript{16}. In addition, reimbursement for APPs seeing patients postoperatively would be included in the postoperative fee. The advantages of this model are that it provides substantially faster access for patients to the practice, often yields similar patient satisfaction scores, and allows the practice to identify many more patients who potentially require surgery\textsuperscript{17}. The potential drawbacks of this model are that some patients are more comfortable seeing a physician and that the MSK expertise of APPs may depend on the number of years of on-the-job experience, resulting in variability of care.

In a collaborative role, the APP can evaluate new and postoperative patients, discussing each one with the physician in real time. The physician handles the billing and must be present during the encounter. However, this can lead to billing compliance issues if the presence of the physician is questioned, leading some organizations to avoid this type of billing. This model has the benefit that all patients see a physician for some amount of time. It allows for a more streamlined patient-physician encounter, permitting the physician to see a greater total number of patients because the history-taking, physical examination, and documentation are largely completed by the APP. This model may also obviate the need for the physician to see routine postoperative patients. Most importantly, the ongoing review of each new patient serves as a continuing education process for the APP. The potential drawbacks of this model include a more limited increase in new-patient throughput compared with the independent role model and the lack of independence for the APP.

Perhaps the optimal model would be a hybrid of both roles, with both collaborative time and time as an independent practitioner. Indeed, the majority (56%) of 48 orthopaedic surgeon respondents in our symposium who employed an APP practitioner. Indeed, the majority (56%) of 48 orthopaedic surgeon respondents in our symposium who employed an APP. This model may also obviate the need for the physician to see routine postoperative patients. Most importantly, the ongoing review of each new patient serves as a continuing education process for the APP. The potential drawbacks of this model include a more limited increase in new-patient throughput compared with the independent role model and the lack of independence for the APP.

The next key decision is to determine which patients will see APPs instead of physicians. The APPs could see postoperative patients, but it would need to be determined whether this is appropriate for all types of surgical procedures in all subspecialties. Finally, what role for integrating APPs with nonsurgeon physicians is best?

While discussing the benefits of the expansion of APPs, we would be remiss if we did not acknowledge some hurdles to expansion. Surgeons more often work nights and weekends compared with their APP counterparts. Currently, approximately 50% of APPs take call for their practice\textsuperscript{18}. Will this create a system in which APPs work daytime shifts while physicians work after hours? Furthermore, how will surgeons receive a patient demographic shift that may leave them only seeing the difficult, potentially more dissatisfied postoperative patients?

In addition, it will be important to consider the “equal pay for equal work” debate, in which APPs are fighting to be reimbursed at the same rate as physicians for the same billing codes\textsuperscript{19}. Orthopaedic surgeons could fall on either side of this debate. As employers of APPs, equal pay would allow for increased reimbursement and revenue streams. However, this would also provide the possibility that PAs will move into independent practices.

**PAs in Orthopaedic Surgery**

For the past 3 decades, PAs have been members of a growing profession that has fit well into the practice of orthopaedic surgery in the United States. PAs are cost-effective to train. Programs are 24 to 27 months in length and accept students who have a bachelor’s degree with premedical prerequisites. The curriculum is based on the medical school model, with 1 year of didactic curriculum that resembles the first 2 years of medical school and 1 year of clinical rotations that are almost identical to the third year of medical school. Currently, most PA programs teach MSK care in the didactic curriculum but do not require a clinical clerkship in orthopaedic surgery. PA students get experience in MSK diagnoses during their primary care and emergency medicine clerkships. However, orthopaedic exposure in primary care and emergency medicine settings may not provide comprehensive MSK training\textsuperscript{20–22}. Graduates obtain a master’s degree and take a national certification examination in order to obtain a license to practice.

As of 2013, approximately 100,000 PAs were practicing in the United States. Approximately 65% are female and four-fifths are less than 55 years old. By 2014, there were 196 accredited PA training programs, with more than 50 new ones in development. Enabling legislation in all 50 states allows PAs to practice and to have prescribing privileges. PAs have traditionally worked in primary care, but increasing numbers are being attracted to medical and surgical specialties, including orthopaedics. The number of PAs in surgical specialties increased by 186% from 1997 to 2006\textsuperscript{23–24}.

Many studies have documented the cost-effectiveness and quality of care delivered by PAs. Working as a team with a physician, they have been shown to increase patient satisfaction, reduce costs, reduce waiting times, increase time spent with the patient, and increase the overall productivity of a clinical practice\textsuperscript{17,25–29}. PAs are paid approximately one-third as much as their physician counterparts, and they can generate many multiples of their salary as practice revenue. Salaries for orthopaedic PAs start at approximately $80,000, while the mean salary is approximately $116,000 with a mean annual bonus of $16,000\textsuperscript{30}.

In a clinical orthopaedic practice, PAs perform a wide variety of tasks, from office visits and minor procedures to assisting in surgery and making hospital rounds\textsuperscript{31}. PAs generally see a range of diagnoses that are 85% to 90% of those seen by their attending physician\textsuperscript{32}. Furthermore, only 15% of PAs share a clinic schedule with their supervising physician all of the time\textsuperscript{33}.
In 2004, the reduction of physician resident hours by the Accreditation Council for Graduate Medical Education (ACGME) resulted in accelerated use of PAs in teaching hospitals. They work alongside residents and fill coverage gaps in the operating room, hospital floors, and the emergency room.

Postgraduate residency training for PAs has existed for more than 20 years. These are typically 12-month clinical training programs at large teaching hospitals that are elective for PAs, in contrast to the situation for their physician colleagues. Only 1% to 2% of all PAs elect to complete a residency program after graduation, as the job market at the time of graduation has been strong. Residency training is a cost-effective way to provide advanced training through exposure to a high volume of high-acuity cases in a short amount of time. Like physician residents, PA residents take call; cover the emergency room, operating room, and hospital floor; and see hospital patients for initial consultations. Although there is not federal financial support to run PA residency programs, hospitals can charge for PA services, bringing in revenue to support the residency program.

Accreditation of PA residency programs was begun by the Accreditation Review Commission for Physician Assistants (ARC-PA) in 2012, among some controversy within the profession. Concern that specialty training programs might lead to mandatory residency training for PAs was expressed by the American Academy of Physician Assistants (AAPA). All physician assistants take a common national board examination to become certified. Specialty certification is also available to those who practice in orthopaedic surgery. This Certificate of Added Qualification (CAQ) in orthopaedic surgery, according to the National Commission on Certification of Physician Assistants (NCCPA), “includes four core requirements: (1) Category I specialty CME [continuing medical education], (2) one to two years of experience, (3) procedures and patient case experience appropriate for the specialty, and (4) a specialty exam... Once awarded, a CAQ will be valid for a period of ten years (provided that licensure status and PA-C certification are maintained).”

**NPs in Orthopaedic Surgery**

The NP profession grew out of the primary care shortages in the early 1940s and 1950s. During this time, nurses’ roles and responsibilities expanded into primary care providers, nurse anesthetists, and midwives. In the post-Vietnam War era, the primary care shortage continued to grow. In 1965, Drs. Henry Silver, MD, and Loretta Ford, NP, developed the first official NP educational program at the University of Colorado. As of 2014, there were 350 accredited NP programs and approximately 205,000 practicing NPs in the United States. There are over 900 million patient visits to NPs annually. It is estimated that approximately 80% of NPs practice in primary care.

NPs are prepared at the master’s or doctoral level, are licensed to practice in all 50 states, and are required to hold national certification in all but 2 states (California and New York). They practice under the rules and regulations of the state in which they are licensed. Currently, 21 states and the District of Columbia allow full practice authority to NPs, meaning that they are not required by law to have physician supervision. NPs are nationally certified in their population-focused specialty area (adult, pediatric, etc.). NPs have advanced education in pathophysiology, pharmacology, clinical diagnosis, and treatment. NPs can prescribe medicine in all 50 states and the District of Columbia and are widely recognized as expert health-care providers.

NPs manage a patient’s overall health care. Services performed by NPs include ordering, performing, and interpreting diagnostic tests; diagnosing and treating acute and chronic conditions; and inpatient acute hospital care. NPs practice across all specialties, including orthopaedics.

The standard NP curriculum is dictated and evaluated by the American Association of Colleges of Nursing (AACN) and requires course work devoted to common MSK care, typically in a primary care or emergency medicine setting. However, as with PAs, this may not provide comprehensive MSK training. Duke University’s NP program offers an additional elective class devoted to orthopaedics. The course work and clinical rotations vary slightly among programs, but must meet the requirements of the AACN for program accreditation and are typically focused on the specialty area. There are currently only 2 postgraduate programs in orthopaedics (at the University of North Carolina at Chapel Hill and University of Massachusetts at Lowell), which accept a limited number of applicants each year. The National Association of Orthopaedic Nurses (NAON) offers a certification examination to qualified individuals. Also, the American Association of Nurse Practitioners (AANP) offers ongoing continuing education and a specialty-track conference to address the growing interest in orthopaedics and other specialties.

A review examining over 40 years of NP research demonstrates that the care provided by NPs is equal to, and in some cases better than, care provided by physicians. Patient satisfaction is also rated similarly by patients who are seen and treated by NPs. Of note, malpractice rates are consistently <2%. In 2009, researchers at the University of California, San Francisco surveyed over 30 individuals, primarily physicians, from specialty medical practices across the United States who employed NPs and PAs. Overwhelmingly, specialty practices viewed NPs and PAs as integral to their practice, reducing wait times and improving quality.

**Moving Forward**

Contemplating the potential MSK specialization of PAs and NPs, it is important to first consider the historical evolution of orthopaedic surgery out of general surgery. Initially, general surgeons with an interest in the MSK system were “grandfatherted” into the field as it grew in scope throughout the late 19th and early 20th centuries in the United States. Eventually, as knowledge and techniques improved after World War I, formalized educational curricula and standardization emerged in the 1930s despite opposition from general surgeons who wanted to continue to practice in orthopaedics.
Currently NPs and PAs do not have formalized mandatory orthopaedic training in their school curriculum, but are rather “grandfathered” into orthopaedic-specific practices through on-the-job training. Indeed, 63% of 35 orthopaedic surgeon respondents indicated that it took 6 months or more before their hired NP or PA contributed to their practice in the way that they envisioned (Fig. 2).

With expanded roles and new technologies, however, it will be important to determine whether a more standardized MSK curriculum for APPs will be necessary. Focusing on baseline topics for this standardized curriculum, including the diagnosis and work-up of the most common outpatient MSK issues, an understanding of the “can’t miss” orthopaedic emergencies, and the management of inpatient orthopaedic patients after common orthopaedic operations, would help MSK clinical competency to be achieved quickly.

The historical factors that pushed orthopaedic surgery into subspecialization included (1) increased number of treatment options within the field, (2) increased number of patients with MSK diagnoses from World War I, (3) increased membership in orthopaedic-specific organizations, and (4) a movement in medicine toward more specialized curricular requirements. In contemplating whether APPs are ready for MSK specialization, we need to consider whether these same factors are now influencing the PA and NP professions.

With this in mind, we recommend the following steps as we move forward as a profession: (1) Ensure that the AOA leadership reaches out to the leadership of both the AANP and the AAPA and PAOS (Physician Assistants in Orthopaedic Surgery) to direct discussion on ideal APP integration models. (2) Connect with the leadership of both the AANP and the AAPA and PAOS to assist in the development, funding, and design of standardized APP orthopaedic curriculum contents. (3) Conduct a survey of orthopaedic surgeons and APPs to determine whether demand for residency and fellowship training programs exists. Specifically, the AOA could sponsor a research project investigating (i) the current usage of APPs in orthopaedic practices, (ii) the MSK-care experience of APPs on entering an orthopaedic practice, (iii) the additional amount that employers are willing to pay for an APP who has residency training, (iv) the amount of time after hiring before an APP begins performing at the expected level, and (v) the potential return on investment from an economic and patient safety perspective for APP orthopaedic residencies.

**Summary**

MSK workforce needs are increasing and will continue to rise. As a medical community, we will need to innovate and determine the best ways to meet these needs. Expanding the roles of PAs and NPs represents one of the most feasible and easily implemented routes to address these growing demands.

APPs are currently integrated into the MSK workforce through 3 main models: as independent providers, as collaborative providers, and through a hybrid model. However, the ideal method is still up for debate.

If APPs continue to expand their MSK care roles, their training process will need to be considered. The current curriculum of APPs contains little mandatory MSK training. When polled on what the AOA as an organization should do next, approximately 80% of attendees responded that we should work with the PA and NP organizations to create new MSK residency and fellowship programs. Another 85% agreed that we should work on creating an MSK curriculum to follow PA or NP schooling, while none of the attendees wanted the AOA to ignore the potential role of APPs in MSK care.

Increasing MSK workforce demands will require a change from the status quo, but more concrete investigations are needed. This paper serves as a catalyst for exploring the possibilities and
hurdles of further integrating NPs and PAs into the orthopaedic workforce.

References

Physician assistants reduce resident workload and improve care in an academic surgical setting

Natalie Dies, MSc, BHSc; Saira Rashid, BHSc; Maureen Shandling, MD; Carol Swallow, MD, PhD; 
Alexandra M. Easson, MD, PhD; Erin Kennedy, MD, PhD

ABSTRACT

Objectives: Educational demands coupled with restricted hours reduce residents’ availability to provide care at academic hospitals. Physician assistants (PAs) may address this issue. This study assessed the effect of PAs on patient discharges, resident workload, and resident perceptions of PAs on a surgical team.

Methods: Two PAs were employed on teams caring for complex surgical patients. Measures included time of discharge order entry, hours residents spent on the electronic medical record (EMR), and resident opinions of PA effectiveness.

Results: The teams with PAs had a 0.5% late discharge and 16% early discharge rate. Junior residents with a PA on the team spent fewer hours on the EMR. Residents reported PAs significantly improved their rotation and quality care.

Conclusions: PAs reduce resident workload and improve care on surgical teams in a tertiary hospital.

Keywords: physician assistants, resident education, resident surgical teams, improved patient outcomes, Canada, workforce

Improving physician in training well-being and reducing fatigue are an increasing priority in Canada, prompting regulatory changes limiting resident duty hours. In Ontario, the Professional Association of Interns and Residents of Ontario-Council of Academic Hospitals of Ontario (PAIRO-CAHO) has terms of employment that limit in-

hospital overnight calls to a maximum of one in four nights and a maximum of 24 hours consecutive work.1 A crossover period for adequate patient care handover also is required.1 Many other factors affect the resident hospital workforce. For example, the resident workforce has not increased, and fewer housestaff are available in hospital to provide continuity in patient care, particularly when a resident is postcall. Furthermore, increasing formal education obligations for residents have further taken residents away from the hospital. Lastly, although computerized physician order entry has been shown to decrease medical error and may improve organizational efficiency, computerized orders take more provider time at point of entry, thus residents need more time to enter computerized patient orders than handwritten ones.2,3 Restricted resident work hours have already caused significant workforce issues in Canada, and coupled with an aging population and increasing prevalence of chronic disease suggests that PAs and NPs will be increasingly necessary to maintain quality care and patient safety. These challenges have led many academic hospitals to consider using physician assistants (PAs). PAs are less well-known in Canada than in the United States, although the NP is well-known in Canada. PA practice in the United States is guided by the national professional society, the American Academy of Physician Assistants (AAPA), but governed and regulated in each state. The AAPA recommends that state PA practice laws include:

- Licensure as the regulatory term
- Full prescriptive authority
- Scope of practice determined at the practice level
- Adaptable collaboration requirements
- Chart cosignature requirements determined at the practice
- Number of PAs a physician may supervise determined at the practice level.

PAs were introduced into the Ontario healthcare system in 2007. They are not a regulated healthcare profession, and have a more restrictive scope of practice until regulation can be achieved.3 Meantime, medical directives are implemented, specifying the medical procedures and treatments that may be performed by the PA on a defined patient population under the supervising physician(s); these directives are specific to each institution.4 In Ontario, the typical PA model is one PA under the direct supervision of one

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staff physician in primary care internal or emergency medicine within a community setting. Little data exist as to the effect of PAs in this model of care.

Recently, the Division of General Surgery at Mount Sinai Hospital in Toronto employed two PAs as members of the academic general surgical inpatient care team. The team consists of surgeons, clinical fellows, residents, and medical students. Because this was both a new PA model and unique PA position, we wanted to describe the effect of the PA in the team setting. The objectives of this study were to:

- determine if PAs reduced the number of late hospital discharges (defined as occurring after 10 a.m.)
- determine if PAs decreased the number of hours residents spent on the electronic medical record (EMR)
- elicit residents’ perceptions of the PA as a member of the surgical team.

METHODS
Two PAs were employed in the Division of General Surgery at Mount Sinai Hospital starting in November 2012. They were assigned to one of three general surgery teams; each team consists of two to three staff surgeons, one clinical fellow, one senior resident, and one junior resident. Each team provides care for about 20 acute surgical patients undergoing breast, colorectal, or multivisceral resections. The PA’s work hours were 6:30 a.m. to 2:30 p.m. Monday through Friday. The PAs attended morning care rounds with the residents; gave patient report to nurses; attended interdisciplinary rounds; planned for patient discharge; assisted in clinic with patient interviews and physical examinations; assisted in the OR with retraction, closure of incisions, and patient transfer to postoperative recovery; and assessed on the unit and in the ED by triaging patients and alerting the surgical team about urgent issues.

Discharge data Over a 13-month period (December 2012 to December 2013), the PAs prospectively collected discharge data onto data abstraction sheets developed by the PAs and their supervising physicians. The data collected included timely completion of home care referrals, time of discharge orders entered into the EMR, prescriptions, and any reasons for delay of discharge. Data were documented in a binary fashion (“yes” or “no”) to state whether the PAs and resident teams were able to complete the home care referral the day before discharge, enter the discharge order before 10 a.m., and have the prescription written (if patient required one) by a resident for the 10 a.m. discharge. Reasons for delay of discharge were documented in free text by the PAs as either delay due to late discharge order, medical reassessment, resolution of outstanding medical issue, or awaiting staff approval of the patient discharge plan. Data from the abstraction sheets were combined and analyzed in a spreadsheet program. A planned discharge was defined as any discharge that met the following criteria:

- the home care referral was completed the day before discharge
- prescriptions were ready by 10 a.m. on the discharge day
- a discharge order was entered into the EMR by 10 a.m. on the discharge day.

A planned late discharge did not meet these four requirements; for example, if the prescription was not written before 10 a.m. During the early data collection phase of the study, unplanned early discharge emerged as an unexpected but important outcome measure that was included in the study. Unplanned early discharges were defined as patients deemed not ready for discharge during morning rounds but who were subsequently discharged later the same day after reassessment by the surgical team. Surgical reassessment often involved follow-up of adequate oral intake, blood work, imaging results, or liaison with a consulting service.

These data collected by the PAs were compared with data previously collected over 2 months by nursing unit administrators on the surgical units, who examined the reasons for delayed patient discharges. These data identified that late physician order entry contributed to delayed patient discharges and represented an area for improvement in patient care.

Resident computer time All orders for patients admitted to the surgical unit at Mount Sinai Hospital must be entered into the EMR. Test results, interdisciplinary notes, and active medications also are documented in the EMR. The hospital informatics department provided the number of hours that each junior resident logged onto the EMR system each week to provide direct patient care. We used these hours as a surrogate measure of resident workload. Users are automatically logged out of the system after being idle for 20 minutes. The junior resident is typically the team member who does the electronic order entry for inpatients because after morning rounds, senior residents immediately report to the OR for patient preparation and staff surgeon report. Junior residents also are the first to be called for unit and on-call issues. Because of this, we excluded senior residents from the analysis and only compared junior resident hours logged on the EMR for teams with and without a PA.

Resident perceptions of PAs on the team We developed a resident satisfaction survey to elicit resident perceptions of the effect PAs had on patient care and resident workload. The unvalidated survey consisted of 24 items rated on a 5-point Likert scale. The survey was e-mailed to all fellows and residents on the two teams with a PA at the end of their rotation and was reviewed anonymously. One e-mail reminder including the survey link was sent to all nonresponders 2 weeks after the initial e-mail.

Data analysis Descriptive statistics were used to present means and standard deviations for continuous variables and proportions for dichotomous variables. Differences were tested using the student’s t-test for continuous data. Resident survey data and any commentary were examined but not analyzed on software.
RESULTS

Discharge data Over the 13-month study period, the two surgical teams with PAs had 848 planned discharges (Table 1). Of these, 0.5% (4 of 848) did not have discharge orders by 10 a.m. and were considered late discharges using the study criteria for late discharges. Discharge data gathered before PAs joined the teams showed a late discharge rate of 20% (25 of 126) over 2 months, with the most common reason for delay being home care forms that were not completed on time.

Teams with PAs had 132 unplanned early discharges, primarily because the PAs ensured that patients were assessed before 2:30 p.m. to determine if they were ready for discharge. Similarly, the PAs could resolve any outstanding medical issues that were preventing discharge in an ongoing fashion throughout the day until 2:30 p.m. Surgical teams that did not have a PA often were unable to perform reassessments until the end of the day when the residents returned to the units after finishing their clinical duties in the OR or clinic. By this time in the evening, discharge was difficult to coordinate. For example, allied health staff and home care coordinators were no longer in hospital and the patient had to wait until the following day for safe discharge.

Resident workload Over the study period, 41 junior residents completed a general surgery rotation at Mount Sinai Hospital. Junior residents on the team without a PA spent about 10 hours more per week on the EMR compared with junior residents on teams with PAs (31.3 hours compared with 21 hours, P<0.05). No significant difference was found in the number of hours the junior residents logged on the EMR between the two teams in which a PA was assigned (19.7 hours versus 21.6 hours, P>0.05).

Resident perceptions of PAs on the team The survey to elicit resident perceptions effect of PAs on resident workload was sent to all 72 residents who completed a general surgery rotation at Mount Sinai Hospital during the study period. Of these, 45 returned the completed survey, for a response rate of 63%.

In terms of resident workload, residents’ perceptions were that having a PA on the team significantly decreased the time residents spent completing home care forms (91%) and discharge summaries (91%), decreased the number of pages that they received (77%), and made it significantly easier to get to the OR (78%) and educational sessions (79%), and leave postcall by noon (71%) (Table 2). Optional comments by the residents on the survey suggested that one of the biggest gains was letting them get to the OR in the morning on time and letting junior residents get to the OR more often. Other positive statements received were: “Before the PA arrived I was struggling to keep up with basic patient care… I think most importantly it improved patient safety,” and “As constant team members they eased orientation into the surgical system … enhanced patient flow and communication with the nurses.” Importantly, 90% (38 of 42) agreed that the PAs significantly improved the overall quality of their surgical rotation when compared with other surgical rotations without a PA.

Residents also agreed that the PAs significantly improved patient care and communication. Residents indicated that the PAs significantly increased the efficiency of the discharge process (93%) and morning rounds (98%); improved consistency and quality of morning report (79%); improved quality of communication between the surgical team, nursing, and other healthcare professionals (93%); decreased wait time for patients to be assessed on the unit (79%); and significantly improved the overall quality of care provided to patients (93%).

DISCUSSION

Our study suggests that PAs can be successfully integrated on a surgical resident team in a tertiary academic setting in Canada. Overall, the introduction of PAs onto our surgical teams
• decreased late planned discharges after 10 a.m.
• increased unplanned early discharges with earlier reassessment and/or coordination of care
• decreased resident workload
• improved resident satisfaction with their rotation.

Implementation of PAs on our general surgery service led to a significant decrease in late discharges from 20% to 0.5% and increase in unplanned early discharges from 0% to 16%. This resulted in improved bed flow and possibly translated into a 1-day decrease in length of stay on our service, according to the quarterly hospital audit. Length of stay was not measured in this study; however, the audit data were brought forth to the Division of General Surgery and coincided with implementation of the PAs. These results are in keeping with other studies that have reported a decrease in length of stay by 0.7 to 3 days with the use of PAs and NPs.7–10 The PAs on our service were able to effect this change primarily by ensuring that home care referrals were completed before the day of discharge and that prescriptions were written in advance for signature by the physician.

Another significant advantage of having PAs was that they were available during the day, when staff and residents were in the OR, to coordinate discharge planning with the nursing team and other healthcare professionals. PAs acted as a liaison with these services and addressed all patient issues, allowing for coordinated discharge planning. These observations are supported by Moote and colleagues, who

<table>
<thead>
<tr>
<th>TABLE 1. Late physician discharge orders without and with PAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data were collected over 2 months before PAs were introduced to the teams.</td>
</tr>
<tr>
<td>Without PAs</td>
</tr>
<tr>
<td>Total discharges</td>
</tr>
<tr>
<td>Late MD discharge order (%)</td>
</tr>
</tbody>
</table>
surveyed organizational leaders at major academic medical centers across the United States for their opinions on the effects of integrating PAs or NPs on resident teams. Respondents ranked accessibility of the PAs and NPs to other members of the interprofessional team as the most valuable contribution of the PA to the team and organization.

This study showed that PAs significantly reduced the electronic order entry workload for junior residents. Junior residents with a PA on the team were logged onto the EMR 10 hours less on average per week than residents without a PA. This was despite the fact that PAs during this study time period were not able to enter medical orders themselves. Most likely, the time saved was due to the PAs reviewing blood work and imaging and summarizing pertinent results for the residents, entering orders for quicker resident cosignature, and completing home care referrals. Although these

<table>
<thead>
<tr>
<th>TABLE 2. Resident perceptions of PAs on surgical teams (number of responses)</th>
<th>Strongly disagree (1)</th>
<th>Disagree (2)</th>
<th>Neutral (3)</th>
<th>Agree (4)</th>
<th>Strongly agree (5)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resident workload</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significantly decreased the time I spent on EHR</td>
<td>0</td>
<td>5</td>
<td>12</td>
<td>17</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Significantly decreased the amount of time I spent completing home care forms</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>11</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Significantly decreased the amount of time I spent completing discharge summaries</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Significantly increased the efficiency and quality of the discharge process for patients on our team</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>15</td>
<td>27</td>
<td>5</td>
</tr>
<tr>
<td>Significantly decreased the number of pages for unit issues and minimized interruptions to my workflow</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Significantly improved the consistency and quality of morning report to the nursing staff</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>14</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Significantly improved the level and quality of communication with nursing staff and allied health</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>18</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>Made it significantly easier for me to go to clinic</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>8</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Made it significantly easier for me to go to the OR</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>Made it significantly easier for me to attend my weekly off-site teaching sessions</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>16</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Made it significantly easier for me to leave postcall by noon</td>
<td>3</td>
<td>0</td>
<td>7</td>
<td>13</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Significantly helped improve the overall efficiency of the team</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>29</td>
<td>5</td>
</tr>
<tr>
<td>Significantly helped improve the overall quality of care provided to patients</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>16</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Significantly improved the overall quality of my surgical rotation</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>13</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td><strong>Patient care and safety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could safely enter blood work orders on EHR</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>17</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>Could safely enter imaging orders on EHR</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>18</td>
<td>22</td>
<td>4.5</td>
</tr>
<tr>
<td>Could safely enter a discharge order for a patient</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>13</td>
<td>27</td>
<td>5</td>
</tr>
<tr>
<td>Could safely assess stable patients in the ED</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>13</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Could safely enter fluid orders for the patients on our team</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>16</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>Knows their limitations and appropriately requests back-up</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>Significantly improved the surgical team’s efficiency on morning rounds</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>17</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>Significantly improved the wait time for patients to be assessed on the surgical unit and in the ED</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>16</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Significantly improved overall patient care and patient flow on our service</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>19</td>
<td>24</td>
<td>5</td>
</tr>
</tbody>
</table>
results show a significant reduction in the number of hours that junior residents were logged onto the EMR each week, these data indicate that even with PAs, junior residents were spending 3 to 4 hours per day on the EMR. Since this study was completed, medical directives have been developed to let PAs enter orders without physician cosignature for blood work, blood cultures, ECGs, and nasogastric tube insertion after demonstration of appropriate training. This could further reduce the number of hours per day that junior residents enter electronic orders.

The survey also found that 80% of residents reported that PAs significantly decreased the time spent completing home care forms and discharge summaries compared with experiences on other surgical teams without PAs, decreased the number of pages that they received, and made it significantly easier to get to the OR and educational sessions and leave postcall by noon. Residents also felt that integration of the PAs onto the service significantly improved patient care primarily by facilitating more effective communication between the surgical team, nursing, and other healthcare professionals.

These findings are similar to other studies on the integration of PAs or NPs that have been conducted in the United States, where the PA role is well-established. These studies also found that resident workload is decreased, based on a variety of measures including number of pages received, hours slept on-call, hours spent in hospital, hours spent in the OR, amount of resident time saved, and improved resident written test scores.11,12,16

Other studies also have shown high resident satisfaction with PAs.17,18 One Canadian group collected qualitative surveys from residents to explore their opinions about PAs on an orthopedic surgery service.20 Of the six residents interviewed, five reported that PAs reduced their workload by decreasing their clinical responsibilities and three reported that their training was improved by the staff surgeon providing closer supervision during surgery when the PAs acted as second assistants.

One of the main concerns of program directors and department chiefs across Canada about integrating PAs onto resident teams is whether the PA may interfere with department chiefs across Canada about integrating PAs into their training programs.21 This concern may be applicable across all fields of medicine. The PA-resident team model described in this study also may be applicable across all fields of medicine. JAAPA

REFERENCES


ORIGINAL RESEARCH


Physician extenders on surgical services: a systematic review

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**Background:** With the introduction of resident duty hour restrictions and the resulting in-house trainee shortages, a long-term solution to ensure safe and efficient patient care is needed. One solution is the integration of nurse practitioners (NPs) and physician assistants (PAs) in a variety of health care settings. We sought to examine the use of NPs and PAs on surgical/trauma services and their effect on patient outcomes and resident workload.

**Methods:** We performed a systematic review of EMBASE, Medline, CINAHL, and the Cochrane Central Register of Controlled Trials. We included studies (all designs) examining the use of NPs and PAs on adult surgical and trauma services that reported the following outcomes: complications, length of stay, readmission rates, patient satisfaction and perceived quality of care, resident workload, resident work hours, resident sleep hours, resident satisfaction, resident perceived quality of care, other health care worker satisfaction and perceived quality of care, and economic impact assessments. We excluded studies assessing nonsurgical/trauma services or pediatrics and review articles.

**Results:** Twenty-nine articles met the inclusion criteria. With the addition of NPs and PAs, patient length of stay decreased, and morbidity and mortality were unchanged. In addition, resident workload decreased, sleep time increased, and operating time improved. Patient and health care worker satisfaction rates were high. Several studies reported cost savings after the addition of NPs/PAs.

**Conclusion:** The addition of NPs and PAs to surgical/trauma services appears to be a safe, cost-effective method to manage some of the challenges arising because of resident duty hour restrictions. More high-quality research is needed to confirm these findings and to further assess the economic impact of adding NPs and PAs to the surgical team.

**Contexte :** Compte tenu de la réduction du nombre d’heures de travail des médecins résidents et de la pénurie de stagiaires qui en a résulté, une solution à long terme s’impose pour assurer la sécurité et l’efficacité des soins aux patients. Une solution consiste à intégrer des infirmières praticiennes (IP) et des adjoints aux médecins (AM) dans divers contextes de soins de santé. Nous avons voulu examiner l’incidence du recours aux IP et aux AM dans des services de chirurgie et de traumatologie et son effet sur la santé des patients et sur la charge de travail des médecins résidents.

**Méthodes :** Nous avons procédé à une revue systématique des bases de données EMBASE, Medline, CINAHL et du Registre central Cochrane des essais contrôlés. Nous avons inclus les études (tous types de protocoles) ayant analysé le recours aux IP et aux AM dans des services de chirurgie et de traumatologie chez l’adulte ayant fait état des paramètres suivants : complications, durée des hospitalisations, taux de réadmission, satisfaction et perception quant à la qualité des soins chez les patients, charge de travail, heures de travail, heures de sommeil, satisfaction et perception quant à la qualité des soins chez les médecins résidents, satisfaction et perception quant à la qualité des soins chez les autres travailleurs de la santé et retombées économiques. Nous avons exclu les études qui évaluait d’autres services que la chirurgie, la traumatologie ou la pédiatrie et les articles de synthèse.

**Résultats :** Vingt-neuf articles répondant aux critères d’inclusion. Avec l’intégration des IP et des AM, la durée des hospitalisations a diminué et la morbidité et la mortalité sont restées inchangées. En outre, la charge de travail des médecins résidents a diminué, leur temps de sommeil a augmenté et leur temps opératoire s’est amélioré. Les taux de satisfaction des patients et des travailleurs de la santé ont été élevés. Plusieurs études ont fait état d’économies après l’intégration des IP et des AM.

**Conclusion :** L’intégration des IP et des AM aux services de chirurgie et de traumatologie semble être une méthode sécuritaire et rentable pour gérer certains des défis qui découlent de la réduction des heures de travail des médecins résidents. Il faudra procéder à d’autres recherches de grande qualité pour confirmer ces observations et évaluer plus en profondeur les retombées économiques de l’intégration des IP et des AM aux équipes de chirurgie.
With the introduction of resident duty hour (RDH) restrictions and the resulting shortages of in-hospital trainee availability, a long-term solution to ensure safe and efficient patient care is needed. One of the most well-researched solutions is the integration of nurse practitioners (NPs) and physician assistants (PAs) in a variety of health care settings. These NPs and PAs, often called “midlevel practitioners,” “nonphysician providers,” or “physician extenders” (PEs), have been shown to be a safe and effective addition to health care teams. To avoid the negative connotation associated with the term “midlevel practitioners,” we prefer to use the term PEs to refer to NPs and PAs.

These practitioners differ in the training they have undertaken and in their background education. Nurse practitioners are registered nurses (RNs) who have met the requirements for working as bedside nurses and have then completed a graduate degree and training program. Physician assistants have an undergraduate education in a variety of disciplines, including life sciences and health care. They complete a PA training program and may or may not complete a graduate degree, depending on the requirements of their jurisdiction of practice. Both types of practitioners have the ability to prescribe, diagnose and perform medical procedures. The difference between the 2 types is that NPs can work autonomously and are registered under the College of Nurses of a specific jurisdiction, whereas PAs work under a physician or group of physicians and are registered under the respective College of Physicians. Both NPs and PAs have been shown to be valuable members of the health care team in a variety of settings.

With increasing physician workload and decreasing availability of in-house trainees, the use of NPs and PAs has become increasingly popular. Surgical services have been shown to value the importance of NPs and PAs, and evidence has shown the “value added” of having these practitioners on a surgical team in a variety of settings. These providers have been shown to improve access to care, decrease wait times, promote wellness and preventative care, provide continuity of care, foster interprofessional collaboration, improve follow-up, and decrease costs and readmission rates.

We performed a systematic review to examine the use of NPs and PAs on surgical/trauma services and their effect on patient outcomes and resident workload.

**METHODS**

Following the PRISMA checklist (www.prisma-statement.org), we performed a systematic review of the literature on EMBASE, Medline, CINAHL, and the Cochrane Central Register of Controlled Trials in May 2015.

**Inclusion criteria**

- Randomized controlled trials (RCTs), cross-sectional studies, cohort studies, case series and surveys
- Studies examining the use of NPs and PAs on adult surgical and trauma services
- Studies reporting patient-related outcomes, including complications, length of stay (LOS), readmission rates, satisfaction and perceived quality of care
- Studies reporting resident-related outcomes, including workload, work hours, sleep hours, satisfaction and perceived quality of care
- Studies reporting other health care worker–related outcomes, including satisfaction and perceived quality of care
- Economic assessments of the use of NPs and PAs on adult surgical and trauma services

**Exclusion criteria**

- Studies evaluating NPs and PAs in nonsurgical or nontrauma services
- Studies pertaining to pediatric patient services
- Studies not examining the aforementioned outcomes
- Review articles
- Commentaries or letters to the editor

**Search strategy**

An example of the search strategy used when querying Medline can be seen in Figure 1. We queried each database and compiled the results, removing duplicates. Both of us then reviewed the titles independently, followed by abstract review. At both of these stages disagreement led to inclusion. Each of us then reviewed the full manuscripts of the selected abstracts, at which point point consensus was necessary for inclusion. The reason for exclusion at the manuscript review stage is documented in Table 1.

One of us collected data relating to the specified outcome measures. Generic data, such as title, authors, study design, journal and year of publication, were recorded. Specific data relating to the outcomes described in the inclusion criteria were also recorded.

We assessed risk of bias of all included manuscripts (at the study level) using the Cochrane Collaboration’s assessment tool. Given the retrospective design of most of the included studies, a strong risk of bias exists. Most importantly, a strong risk of selective outcome reporting is present in all studies.

Heterogeneity and the qualitative nature of many of the outcomes precluded statistical analysis of the results.

**RESULTS**

**Included manuscripts**

Twenty-nine articles from 29 different first authors met our inclusion criteria (Table 2 and Fig. 2). The most prevalent journal was the *Journal of Trauma*, having published
10 of the articles. Publication dates ranged from 1990 to 2014; however, 21 of the articles were published in the past 10 years. There were 15 case–control articles, 5 retrospective reviews, 8 surveys and only 1 RCT. Specialties included in the 29 articles were trauma service (11), cardiac/cardiothoracic/cardiovascular surgery (7), general surgery (4), orthopedic surgery (3), urology (1) and neurosurgery (1); 2 articles encompassed multiple surgical specialties. Most studies were case–control studies (15) or surveys (8). Overall the methodological quality and level of evidence of the included articles was low, with only 1 level-1 and 1 level-2 study included (Table 2). Notably, a risk of selective outcome reporting existed for all studies.

**Length of stay**

Of the 8 articles that examined patient LOS as an outcome, 7 (88%) found that LOS decreased after the addition of PEs to the service.\(^7\)–\(^{14}\) One paper found the LOS unchanged. Six articles reported actual LOS improvements, which ranged from 0.25 to 2 days (Table 3). Three of the included papers also demonstrated a decrease in intensive care unit LOS.

**Morbidity and mortality**

None of the included studies demonstrated an increase in morbidity or mortality with the addition of PEs to the service in question. Two studies found that complication rates were decreased.\(^{12}\),\(^{15}\) One study found an increase in the rate of diagnosis of deep vein thrombosis after PEs became involved in patient care.\(^{13}\)

**Procedures**

Two articles specifically reviewed procedures performed by PEs.\(^{16,17}\) Bevis and colleagues\(^{16}\) reviewed thoracostomy tube placement in trauma patients, comparing procedures performed by PEs to those performed by trauma surgeons. They found no difference in complication rates when PEs performed the procedure. Young and Bowling\(^{17}\) examined intracranial pressure monitor placement by PEs and found no significant difference in complication rates when compared with monitors placed by neurosurgeons. In addition, Sirleaf and colleagues\(^{18}\) found no difference in complication rates between procedures performed by residents or PEs, including arterial lines, central venous catheters, thoracostomy tubes, bronchoalveolar lavage, percutaneous endoscopic gastrostomy and tracheotomies.

**Effect on residents**

Nine papers examined the effect of PEs on surgical residents.\(^{7,9,19−25}\) The main effects documented included a decrease in overall resident work hours, increased operating room time, reduced number of pages, increased time for educational activities and increased sleep time. Victorino and Organ\(^{22}\) demonstrated decreased resident workload and stress levels and improved resident morale after the addition of PEs.

**Satisfaction**

Six studies found either improved or high patient satisfaction rates with the addition of PEs. None of the included articles demonstrated a decrease in patient satisfaction. Nine articles examined satisfaction rates of surgeons, residents and nursing staff and found overall high satisfaction rates.\(^{4,7,8,23,26−30}\) Improvements to patient care, continuity of care, communication with families, improved clinical documentation and reduced workload for other health care workers were all reported as reasons for the high satisfaction rates.

**Cost**

Five papers reported cost outcomes (Table 4).\(^{10,14,15,25,29}\) All 5 reported cost savings with the addition of PEs; however,
cost savings varied dramatically depending on the study. Decrease in the LOS of patients was responsible for significant cost savings in 2 articles. Bohm and colleagues demonstrated similar total costs with the addition of PEs; however, surgical volumes increased by 42%, and surgical wait times decreased after PEs were involved.

**Discussion**

In surgical specialties, the volume of work can often exceed the capacity of the surgeons, trainees and nursing staff. This can lead to overworked and overwhelmed health care workers. With resident duty hours increasingly under the microscope of regulatory bodies, this problem has the potential to worsen dramatically. Patient safety and continuity of care continue to be highlighted as key issues in the discussion on work hour reform. These issues will persist at both teaching and nonteaching institutes until a sustainable model of care is developed.

Many hospitals have turned to NPs and PAs to help resolve the discrepancy between workload and already overworked employees. It is important that we critically examine the effect that these changes have on the hospital work environment, and most importantly on patient care, before advocating widespread adoption.

Our systematic review of the literature was undertaken to investigate the integration of PEs into surgical specialties and their effect on patients, surgical residents and other health care workers. Our results demonstrate overwhelmingly positive experiences among surgical services using PEs. Overall, patients and other health care workers report high satisfaction rates. Significant reductions in hospital and intensive care unit LOS have been reported after the addition of PEs to surgical or trauma services. Morbidity and mortality remain stable, and some studies have shown a reduction of in-hospital complication rates. An overall improvement in quality of care and continuity of care, as judged by health care workers, is a frequent theme in the studies we reviewed.

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<td>Pediatric services</td>
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Fig. 2. Study selection process. Central = Cochrance Central Register of Controlled Trials.

<table>
<thead>
<tr>
<th>Year of publication</th>
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<th>( p ) value</th>
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<td>2006</td>
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<tr>
<td>2014</td>
<td>Collins et al.(^12)</td>
<td>0.55</td>
<td>0.024</td>
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ICU = intensive care unit; LOS = length of stay; NR = not reported; PE = physician extender.

Table 4. Manuscripts reporting cost savings

<table>
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<th>Rationale for cost savings</th>
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<td>$USD 5038.91/patient</td>
<td>Decreased LOS</td>
</tr>
<tr>
<td>2010</td>
<td>Bohm et al.(^13)</td>
<td>Same cost, with increased surgical volumes and decreased wait times</td>
<td>Eliminated need for fee-for-service surgical assist</td>
</tr>
<tr>
<td>2014</td>
<td>Collins et al.(^14)</td>
<td>$USD 9111.50/patient</td>
<td>Decreased LOS</td>
</tr>
<tr>
<td>2013</td>
<td>A目hhausen et al.(^15)</td>
<td>$USD 130/patient</td>
<td>Decreased patient time in ER, decreased OR setup time</td>
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<tr>
<td>2013</td>
<td>Skinner et al.(^16)</td>
<td>£ 168 653 (annual staff costs)</td>
<td>Annual staffing costs including locums</td>
</tr>
</tbody>
</table>

ER = emergency room; LOS = length of stay; OR = operating room.
In addition, substantial cost savings were reported in several studies. Two groups reported savings of more than $5000 per patient.10,14 Bohm and colleagues29 reported increased surgical volumes and reduced wait list times without changes in expenditure. The studies reporting financial outcomes originated from 3 different health care systems (Canada, United States, United Kingdom), which decreases the generalizability of the results. None of the articles described in detail the funding sources for PEs. The study by Bohm and colleagues29 — the only Canadian study examining costs — reported that funding for the PEs came directly from the provincial health authority. Their cost savings came from eliminating the need for fee-for-service PAs, who are also paid directly by the health authority, in the operating room. This finding could potentially be generalizable to other Canadian health authorities. Given the complexity of hospital budgets, a funding model would likely have to come from the government level in most Canadian centres. Further detailed reports on cost-effectiveness and funding models are needed to help institutions advocate for and implement changes.

With resident duty hours being increasingly regulated, it would be prudent to maximize residents’ educational experiences while they are in hospital. For surgical residents, this means maximizing exposure to the operating room and clinics and minimizing administrative duties. Several studies have demonstrated that the addition of PEs to surgical services helps to accomplish those goals.7,8,19,21-25 Fewer pages and administrative duties have also been shown to increase resident sleep time and to reduce resident workload and stress levels, which may further maximize residents’ educational opportunities. Some institutions in Canada have increased the number of clinical fellows to address resident shortages. Some clinical fellows can fund their positions by billing as a surgical assistant, which eliminates the financial limitations for some institutions. This model runs the risk of degrading both resident and fellow learning experiences by overcrowding the operating room and clinic. We do not believe this is a stable, long-term solution to the problems at hand.

Any changes to current care models should take continuity of care into consideration. Any transition away from the reliance on residents and other trainees (at academic institutions) and 24-hour call shifts has the potential to increase the number of patient handovers between providers.32 Increased handovers may be a source of miscommunication or noncommunication of important patient issues.12,13 Appropriate, detailed handovers and the use of electronic charting/handovers may help minimize these issues.13 Handover of patients should be kept to a minimum; however, the current care models are becoming unsustainable. Our review demonstrates no difference in patient morbidity or mortality when PEs are included in the health care team, although the impact on handover processes have not been well described. Further reports detailing the ideal methods of integrating PEs (e.g., scheduling, handovers, provider roles) would be beneficial to institutions considering a transition to PEs.

Limitations

The main limitation of this review is the heterogeneity of the included studies, which makes the analysis of the results challenging. We attempted to present the important themes highlighted in the literature. In addition, the overall methodological quality of the included studies was low, which increases the risk of bias within the studies. We would advocate for further high-quality studies in this field to confirm the results of our review. As with any systematic review, important articles can be missed. By including a search of 4 major databases, we believe that risk was minimized.

Conclusion

The addition of NPs and PAs to surgical/trauma services appears to be a safe, cost-effective method to manage some of the challenges arising due to resident duty hour restrictions. Further high-quality research is needed to confirm these findings and to further assess the economic impact of adding NPs and PAs to the surgical team.

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Competing interests: None declared.

Contributors: A. Dodd designed the study. Both authors acquired and analyzed the data, wrote and reviewed the article and approved the final version for publication.

References

8. Miller W, Riehl E, Napier M, et al. Use of physician assistants as surgery/trauma house staff at an American College of Surgeons-
The landscape of the orthopaedic workforce is changing. An aging population, rising obesity rates, greater lifestyle expectations, and technologic advances are increasing the demand for musculoskeletal services. At the same time, teaching institutions are under strain amidst resident work-hour regulations and the need to balance patient care and education. These goals collide in today’s economic climate. As lawmakers, patient advocates, and academic centers consider implementation of further resident work-hour restrictions, the fiscal viability of these proposals remains unknown.

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In 2003, the Accreditation Council for Graduate Medical Education (ACGME) reduced resident duty hours to no more than eighty hours per week, averaged over a four-week period. The ACGME implemented these limits out of concern that resident fatigue endangered patients and the residents themselves. The regulations were rooted in the 2001 New York State mandate, Code 405. A growing body of literature underscores the benefits and shortfalls of reduced resident work hours on patient safety, resident morale, quality of life, and education and operative experience. One factor not often discussed is the financial impact of the reduced hours—to our knowledge, no study has evaluated the economic impact of reduced hours in orthopaedic resident education.

Early research on the duty limits shows resident fatigue is still a major problem. This prompted the Institute of Medicine in December 2008 to suggest further work-hour modifications, while other discussions of resident work hours have included reductions to as low as fifty-six hours. Furthermore, some state legislators have discussed criminalizing duty-hour violators. Residents in other countries, such as the United Kingdom, Denmark, New Zealand, and France, work between thirty-seven and seventy-two hours per week. However, physician labor-supply shortages and insufficient training are a problem in these countries.

In light of these calls for additional duty limits, we examined the economic implications of a fifty-six-hour workweek regulation for orthopaedic training programs. Through the use of pilot-survey data, we undertook a cost-sensitivity analysis. Our hypothesis, based on workforce data after the eighty-hour work-week restrictions, was that the economic impact of further reduced hours, especially if not funded by the government, may make the orthopaedic resident workforce unsustainable.

Materials and Methods

A brief survey was delivered electronically to 152 residency programs to determine the number of full-time equivalent (FTE) physician extenders hired after the eighty-hour restrictions were implemented (see Appendix). After an initial review by our institutional review board, it was determined that the study met eligibility criteria for institutional review-board review exemption authorized by 45 CFR 46.101, category 2. Data were collected over a six-month period. Survey results were collected anonymously through an online, secure server. From the data collected, we extrapolated the increased cost of further work-hour reductions. This included sensitivity analyses with a range of changes in cost resulting from the potential policy adjustments and data from previously published work.

In addition, a systematic review of the literature was conducted to determine the impact of the eighty-hour work week in terms of mortality in orthopaedic patients. Medline and EMBASE were used as the search engines to conduct the systematic review. The key words “resident” and “duty hour(s)” or “work hour(s)” and “mortality” and “orthopaedic” were used to guide the search. Following the search, three articles met the following inclusion criteria: (1) in English language; (2) Level I, II, or III study design according to The Journal of Bone and Joint Surgery criteria (because the majority of studies examining work hours were cohort studies, with cohorts of post-work-hour regulations compared with the cohorts of pre-work-hour regulations as controls); (3) a minimum of 100 patients per group in the series; (4) two resident groups: pre-work-hour restriction and post-work-hour restriction; (5) data regarding patient mortality that were extractable in a form that was usable for statistical analysis; (6) thirty-day mortality data; and (7) presence of orthopaedic patients. Studies were excluded if (1) they did not meet the inclusion criteria, (2) the data were not in a form available for extracting mortality data, and/or (3) there was a lack of original data (e.g., reviews or expert opinion were excluded).

The percentage of deaths was compared between resident groups with regard to pre-work-hour and post-work-hour regulations. In addition, odds ratios were generated under the random effects model (DerSimonian and Laird weighting technique). Meta-analytic statistics were calculated with MIX statistical software, version 1.7 (Kitasato Clinical Research Center, Sagamihara, Kanagawa, Japan). To generate a cost-benefit analysis, the percentage of deaths in each group was considered, and the results were translated to “deaths per 10,000 patients.”

Results

Thirty-six (24%) of 152 teaching programs, encompassing 1021 residents, responded to the survey. All survey data were collected by May 2010. There were twenty-nine university-based and seven community-based programs. All questions were answered by the thirty-six respondents.

There was variation in the timing of implementation of work-hour rules: thirty-one programs initiated changes in 2003, three programs met the regulations in 2004, and one program each met the regulations in 2002 and 2009, respectively. The resident demographics of individual program respondents are represented in a table in the Appendix. Thirteen (36%) of thirty-six programs increased the number of residents (range, two to twenty new residents per program) from the time of pre-work-hour regulations to April 2009, for a total of 107 new residents added across the thirty-six surveyed programs. Eighty-six percent of programs experienced a change in the number of operating attending surgeons on staff between 2002 and April 2009 (see Appendix). Five university-based programs saw a decrease in the number of operating attending surgeons (range, two to six fewer attending surgeons per program) at the time of survey, while one community-based program decreased its attending staff by two surgeons. Twenty-five programs increased the number of attending surgeons (range, one to thirty-six additional staff). A table in the Appendix presents moonlighting and night-float systems changes between the time of pre-work-hour regulations and post-work-hour regulations. Twenty-five (69%) programs adjusted their position on allowing senior residents to moonlight (all moonlighting policy changes were in favor of allowing moonlighting): at the time of survey, thirty-two programs (89%) allowed moonlighting, while four programs did not have moonlighting options. No programs had a night-float system in place prior to the work-hour rules; after implementation of work-hour rules, fourteen (39%) of thirty-six programs changed their rotations to include a night-float system.

Prior to work-hour rules, the number of FTE physician-extender staff hired per program ranged from zero to nine ancillary staff members (Table 1). Post-work-hour rules hiring patterns, including number, date, and FTE values per extender hired, are reflected in Table 1. The average salary and benefits for physician extenders were $101,000 for nurse-practitioner FTE staff, $87,000 for physician-assistant FTE staff, and $110,000 for registered-nurse first-assistant FTE staff.
Sensitivity Analysis

Two hypothetical work-hour models were created in order to analyze the survey data (Fig. 1). The first model (Model A) assumed that the present eighty-hour work week would be reduced to fifty-six hours. This model assumes that residents truly work an average of eighty hours per week, that there exists an even distribution of residents across postgraduate years two through five, and that there is a linear relationship between resident hours and FTE hours. The model assumes an eighty-hour average work week per resident, acknowledging the

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<th>Post-WHR Type (No.) of PE Hired</th>
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</table>

*WHR = work-hour regulations, UB = university-based program, PA = physician assistant, CB = community-based program, NP = nurse practitioner, and RNFA = registered nurse first assistant. †Value equals 0.5 full-time equivalent (FTE) units per physician extender (PE) hired.
possibility that certain residents—perhaps postgraduate-year-two (PGY2) residents—may log more hours than senior-level residents do. For example, a PGY2 resident may work eighty-five hours, whereas a PGY5 resident may work seventy-five hours; between the two residents, there are eighty hours of work done per resident, on average. In this first model, the number of average hours that would be reduced per week, per resident, would be twenty-four hours (i.e., eighty hours minus fifty-six hours).

The second model (Model B) applies workforce data from the 2005 study by Zuckerman et al.\textsuperscript{2} Analysis from this study demonstrates a de facto work week of seventy-three hours, averaged across all resident training levels. This second scenario creates a seventeen-hour work-hour differential (i.e., seventy-three hours minus fifty-six hours).

The model compares the number of deaths pre- and post-work-hour restrictions. It assumes an increase in the number of attending staff, which can potentially confound the number of corresponding FTE staff hired. The model also accounts for the variability in the number of hours of resident labor that new FTE staff would be displacing, as well as the theoretical baseline number of hours from which a hospital shifts to the new fifty-six hours.

After implementation of the eighty-hour work week, the average reduction in work hours was approximately five hours per week. One hundred and forty-three physician extenders (142 FTE staff) were hired to meet compliance, at a frequency-weighted average cost of $96,000 per FTE staff. A further reduction to fifty-six hours would increase the cost by $64,000 per resident. With approximately 3200 orthopaedic residents nationwide (3259 residents, according to recent ACGME data\textsuperscript{1}), the increased cost would be $208 million per fiscal year (Model A). For each hourly decrease in work hours, the cost is $8 million to $12 million over the course of a fiscal year. Based on more conservative “real-world” data from previous studies (applied to Model B), the reduction in work hours performed per resident translates into an increased cost of $147 million per fiscal year.

To control for increases in the number of attending staff potentially confounding the number of corresponding FTE staff hired, a subgroup analysis was performed for the eleven programs that saw a decrease or no change in the number of hired attending surgeons after implementation of work-hour rules. These eleven programs (seven university-based programs and four community-based programs) encompassed 226 residents. Thirty-two FTE staff were added across these programs, with a frequency-weighted average cost of $88,600 for each physician extender hired. Two of these programs allowed

### Table II: Benefit of Work-Hour Regulations (WHR) for Orthopaedic Patients

<table>
<thead>
<tr>
<th>Study</th>
<th>Patient Population</th>
<th>Odds of Death (Pre-WHR vs. Post-WHR) (95% Confidence Interval)</th>
<th>Percent of Deaths Pre-WHR</th>
<th>Percent of Deaths Post-WHR</th>
<th>Difference</th>
<th>Benefit in Deaths per 10,000 Patients*</th>
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</thead>
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<tr>
<td>Volpp et al.\textsuperscript{29}</td>
<td>All orthopaedic cases</td>
<td>1.12 (1.11 to 1.14)</td>
<td>2.46%</td>
<td>2.19%</td>
<td>0.27%</td>
<td>27</td>
</tr>
<tr>
<td>Volpp et al.\textsuperscript{28}</td>
<td>All orthopaedic cases</td>
<td>1.26 (1.12 to 1.42)</td>
<td>1.87%</td>
<td>1.49%</td>
<td>0.38%</td>
<td>38</td>
</tr>
<tr>
<td>Browne et al.\textsuperscript{5}</td>
<td>Hip fracture cases</td>
<td>1.11 (0.93 to 1.34)</td>
<td>2.78%</td>
<td>2.45%</td>
<td>0.33%</td>
<td>33</td>
</tr>
<tr>
<td>Weighted average†</td>
<td>NA</td>
<td>1.16*† (1.07 to 1.25)</td>
<td>NA</td>
<td>NA</td>
<td>0.31%</td>
<td>31</td>
</tr>
</tbody>
</table>

*Not enough information based on the studies available to attribute benefits to work-hour reductions. †Significant at the <0.001 level. ‡NA = not applicable.
moonlighting by the time of survey. Four programs employed a night-float system after the work-hour rules were in place. Based on Models A and B, respectively, the reduction in work hours performed per resident translates into an increased cost of $197 million or $139 million per fiscal year. Likewise, when performing a subgroup analysis on the twenty-three programs (seventeen university-based programs and six community-based programs) that saw no change in the number of residents (a total of 567 residents) before and/or after work-hour rules, the associated increased costs for Models A and B were $145 million and $103 million, respectively, per fiscal year.

Mortality data, adjusted odds ratios, and weighted percentages are presented in Figure 2 and Table II. Based on cost-sensitivity analysis (Model A, reducing work hours from eighty to fifty-six hours) and assuming that the weighted average death rate per 10,000 is true, in order to save one patient in 10,000, the cost to the system is approximately $6.7 million. This is an estimate based on prior assumptions particular to this model, not accounting for the confounding cost factors mentioned before.

**Discussion**

The ACGME’s decision to regulate resident work hours has added considerable costs to teaching hospitals. Our study examined the financial impact on orthopaedic training programs, and it represents the first cost-sensitivity analysis of resident duty limits on orthopaedic training programs. The financial impact of work reductions is immense. The passage of the work-hour limits on orthopaedic training programs. The financial impact associated with these costs as they struggled with decreasing third-party payments and reductions in Medicare reimbursement for services. Despite the considerable costs, most ACGME-accredited orthopaedic programs have been compliant with the duty-hour limits.

Previous studies have examined the costs of the initial reductions in work hours. For example, Nuckols et al. determined that the 2003 duty limits cost teaching hospitals $3.2 million for substitute providers and $990,000 to $3.5 million for additional residents. The federal government did not provide additional funding to supplement the cost differential caused by the duty-hour limitations of 2003. Thus, teaching hospitals bore these costs as they struggled with decreasing third-party payments and reductions in Medicare reimbursement for services. Despite the considerable costs, most ACGME-accredited orthopaedic programs have been compliant with the duty-hour limits.

One survey of orthopaedic program directors found that 76% of orthopaedic departments hired physician extenders in response to the duty limits. Our pilot data found a similar 86% rate of physician-extender hiring. Problems may occur with this strategy: Peabody suggested that few physician extenders have the desire or training to do orthopaedic work, making recruitment difficult. Moreover, the relatively high salaries of physician extenders increase the financial burden of resident duty-hour limits. Over $96,000 was spent per physician-extender FTE, on average, in this study, with costs as high as $150,000 for registered-nurse first-assistant positions.

Restricted duty hours were designed to reduce the morbidity and mortality associated with medical errors. The literature conflicts on the impact of work-hour reforms, despite the high implementation costs. Although several studies show a benefit in mortality in different populations, others show no change in mortality after work-hour reforms. In our review of the literature, there were three studies that supplied orthopaedic-specific information. Each series showed a reduction in mortality among orthopaedic patients—a benefit of twenty-seven to thirty-eight deaths prevented per 10,000 cases. However, these data must be interpreted with caution: the difference seen in the study by Browne et al. was not significant. In addition, the control group (nonteaching institutions) showed a comparable reduction in mortality over the same time period. This supports the idea that the reduction in mortality could be the result of improvements in technology or some other extraneous factor. After adjusting for factors such as...
as teaching status, Volpp et al., found no difference in mortality in surgical patients. In one of their studies, these authors did find a benefit in mortality after adjustment for medical patients; orthopaedic patients were not specifically separated out in their study. Our meta-analytic data were based on the entire sample (raw data), and thus we were not able to adjust for teaching status. Since this is the case, the argument could be made that, because neither the Volpp studies nor the Browne study found a difference after statistical adjustment, the improvement in mortality was due to other factors occurring in hospitals in the time frame of interest and not solely as a direct result of work-hour regulations. As such, the argument could be made that there was no “benefit” at all to justify the cost.

The significance of this finding, as well as the extrapolation of deaths prevented under proposed further hour restrictions, is an area of debate. In particular, frequent handoffs increase the risk of adverse events. Other conflicting evidence suggests that the mortality in nonteaching groups actually increased in the time period of work-hour restrictions. Since the impact of the work-hours limitations is unclear with respect to decreasing mortality, it is difficult to say if our cost-benefit analysis is applicable to this aspect of the debate. In addition, further limitation of work hours is based on the assumption that the “benefit” would be linear in terms of medical errors and mortality.

Studies indicate that the effects of duty limitations differ among surgery and medical residents. Orthopaedic programs achieve the goal of adequate surgical and care competencies training through immersive educational models, with repeated operative exposure and simulation. Surgical faculty members have expressed concerns that residents will view themselves as shift workers as a result of work-hour reductions. Others have suggested that reduced work hours could discourage residents from entering demanding specialties such as trauma. Furthermore, the greater number of medical versus surgical residents per program also may alleviate the constant need for continuing house-staff coverage in internal-medicine residencies. In this study, 36% of programs increased the number of residents, including both clinical and research positions. From an attending-surgeon perspective, 86% of the programs experienced a change in the number of operating attending surgeons on staff between 2002 and April 2009; data were insufficient to make adequate correlations between type of program, number of residents, and attending-surgeon operating coverage.

A concern has been that surgery residents will not be adequately trained at the time of matriculation. Studies conflict with regard to whether or not this is true. Herndon and Weatherby et al. postulated that operating hours were reduced by 21.5% to 33%. Others found no change in operative volume. Peabody suggested that work-hour reductions short-change residents with regard to clinical experiences rather than operative experience. Other barriers to learning include nightfloat rotations, which tend to be less educational. Moreover, nightfloat provides less continuity of care: residents often are not able to participate in procedures on patients they evaluated during the previous night’s call. Eighty-nine percent of programs allowed moonlighting at the time of the survey, and a substantial 39% of programs added a night-float system to provide additional coverage.

A potential solution for meeting educational goals would be to extend the length of the orthopaedic residency. However, most residents adamantly oppose this idea. Surveyed residents argue that doing so will have little educational benefit and that orthopaedic fellowship training may make up for learning gaps under the reduced work week. This may shift the focus of training to increased subspecialization. Conversely, hospitals may turn to money-generating specialties—even particular subspecialties within orthopaedics—when considering hiring choices. Compounding this is the upward trend of specialization in high-reimbursement fields, such as sports medicine and spine surgery. This creates shortages in orthopaedic trauma and pediatrics; concordantly, the Orthopaedic Trauma Association adamantly opposes further reductions. The American Academy of Orthopaedic Surgeons has suggested several challenges that may make further reductions in residency hours economically nonviable. These challenges include a looming nursing shortage, reduced reimbursement rates, and provision of care for the uninsured. Moreover, a reduction in hours has not been definitely correlated with improvement in patient-centered outcomes.

There are limitations to this study. Not all programs responded to survey requests, and these pilot data are a foundation for larger-scale studies and continued data collection. With all retrospective survey data, reporting and recall bias exist. With more survey data, we might be able to look further at issues of sex, residency size, number of research positions, and type of program. The models assume that (1) five hours less, on average, were worked by residents per week; (2) the effect of work-hour rules was linear for this decreased five-hours-per-week period; (3) the cost of a change in residency hours would be consistent on a per resident basis regardless of program type; and (4) the additional benefit of reducing mortality is due to work-hour restrictions and not some extraneous confounding factor (e.g., better technology, more integrated care, effects of the additional staff alone). Underestimates of total monetary adjustments, such as the values of FTE benefits, may further increase the cost of hiring physician extenders. We did attempt to control for the potential confounding factor of increased attending staff or increased resident complement leading to increased costs per FTE physician extender hired. Despite representation from university-based and community-based programs, no armed forces programs responded to the survey. There was variation in the implementation of work-hour restrictions after the 2003 ACGME ruling, pointing to potentially appreciable time lags between regulatory statutes and reflections in the data collected. Finally, there is inherent variability in self-reported resident survey work-hour data, causing some error in extrapolating data.

In conclusion, ten years ago, the orthopaedic community worried about an oversupply of surgeons. The landscape of the workforce has shifted dramatically. Today, orthopaedists are
grappling with the realities of a workforce shortage. The demand for certain orthopaedic services is expected to rise 23% between 2000 and 2020. Other research shows orthopaedic surgeons make up 2.5% to 3.5% of all physicians but provide 30% to 40% of all musculoskeletal care. Duty limits may ultimately cost society if certain populations, such as those living in rural communities or the underinsured, cannot receive preventative and timely musculoskeletal care.

Further work reductions will have important implications for residency training and the structure of funding support. Teaching hospitals may need to conduct job analyses to maximize learning in shorter periods of time. For instance, residents still spend nine to twenty-four hours per week on noneducational tasks that lower-level providers can perform. Such job analyses require time and resources. Questions also remain on whether the next generation of orthopaedic surgeons will be able to maintain as high a level of commitment to their communities as their predecessors, based on intensity and duration of training. Of interest, the FTE orthopaedic surgeon spends an average of 2200 hours annually—an average of 42.3 hours per week—providing direct patient care.

As the Institute of Medicine and legislators consider further resident duty-hour limits, a number of proposals exist for teaching hospitals to meet the educational and patient safety goals. These include hiring more physician extenders, expanding moonlighting programs, and increasing the number of residency positions. Our pilot study indicates these solutions will cost orthopaedic training programs upwards of $147 million to $208 million per year. Based on our analysis, further work-hour reductions will be costly and potentially unsustainable without supplementary government funding.

Appendix

The survey and demographic tables are available with the electronic version of this article on our web site at jbjs.org (go to the article citation and click on “Supporting Data”).

References


State Main Purpose/Title

Proposal to develop a Global Health Committee

Resident’s Name | Jordan Walters, Catherine Olinger | Residency Program | UTHSC - Campbell Clinic

Are you a Resident Delegate? | Yes | Classification of Proposed AO (To the AAOS, to the RA or Other) | Resident Assembly

WHEREAS: Numerous residents participate or are interested in participating in international electives during residency training, and

WHEREAS: Currently no standards exist to guide appropriate preparation, training, and action in the context of an international elective including guidelines for professionalism, accountability, and ethics

WHEREAS: Resources and opportunities for residents to be involved in global health can be difficult to identify
**RESOLVED A:**

The AAOS Resident Assembly shall create a Global Health Committee for members of the Resident Assembly to address the above needs of the membership.

**REFERENCES:**

3. [https://www.aaos.org/About/Statements/Ethics_and_Professionalism/](https://www.aaos.org/About/Statements/Ethics_and_Professionalism/)
International Programs in the Education of Residents: Benefits for the Resident and the Home Program

Rodriguez, Abigail MD; Ho, Trung MD; Verheyden, Charles MD, PhD

doi: 10.1097/SCS.00000000000002212

Original Articles

Abstract

There is a significant need for basic surgical care worldwide. In recent years, modest improvement in fulfilling this demand has been achieved through international medical mission trips from various organizations. These humanitarian endeavors and global health experiences have generated increasing interest in participating in international missions from surgical residents. However, many academic institutions currently do not have the infrastructure or desire to support surgical residents participating in medical missions. This paper aims to illustrate that careful, planned integration of medical mission trips into the residency curriculum will develop and enhance resident education and experience by fulfilling all six Accreditation Council for Graduate Medical Education (ACGME) core competencies and by benefitting the native program.

Division of Plastic Surgery, Baylor Scott & White Health, Temple, TX.

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Got it, thanks!
It is estimated that half of the world's population lacks access to adequate primary health care and that two-thirds of the population lacks access to orthopaedic care\(^1\). While opportunities for orthopaedic surgeons to volunteer internationally have existed for many years, only a small percentage of practicing orthopaedic surgeons in the United States do so. One reason for this low rate of volunteerism is that physicians who have recently finished residency training face substantial loan burdens. In addition, recent graduates need to establish and build their practices\(^2,3\). Residents at the University of California at San Francisco (UCSF) may elect to participate in an overseas volunteerism program as early as their third postgraduate year. This program is rooted in the hope that early exposure will encourage future participation in similar activities throughout the residents' professional lives. While reports on the early experience of this elective have demonstrated a trend toward increased future participation in volunteerism, to date there have been no formal investigations of the long-term impact of this elective experience on orthopaedic surgery residents\(^4,5\).

International health electives are believed to impact residents-in-training in three ways: providing professional development, affecting health-care resource use, and impacting outlooks and attitudes toward the delivery of health care\(^6\). A recent investigation conducted by the Department of Internal Medicine at Yale University examined the effects of its international elective on resident training. The study found that participants in an international elective were more likely than nonparticipants both to switch from subspecialty medicine to general medicine and to care for underserved populations\(^7\).

While offering an international elective as a standard component of a residency training program may appear to benefit both residents and residency training programs, such electives require a substantial financial commitment from medical institutions and departments, many of which are facing considerable financial strain\(^8\).
The aim of this study was to critically evaluate the effects of an international elective experience on the beliefs and practice habits as well as future volunteer activities of the trainees who completed the elective relative to trainees who had not participated in such an elective.

UCSF began incorporating overseas missions into its orthopaedic resident training program in 1998. In 2001, an overseas elective was established as a formal component of the curriculum. From 2001 through 2008, thirty-one of forty-six eventually graduating orthopaedic surgery residents participated in an overseas volunteer mission. The primary destination of these missions was South Africa, but some residents participated in missions in Nicaragua, Malawi, and China. These trips were conducted under the auspices of Orthopaedics Overseas (http://www.hvousa.org), a well-established nongovernmental organization whose mission is to enhance the availability and quality of health care through education and training. Currently, the UCSF orthopaedic international rotation is a month-long block that takes place during the fourth postgraduate year.

The majority of residents who have participated in this elective rotate at the Orthopaedics Overseas site in Mthatha, a small city located in the Eastern Cape of South Africa. Mthatha houses the Bedford Orthopaedic Center, which provides tertiary orthopaedic care to approximately four million residents of the former homeland of the Transkei. The hospital is affiliated with the Walter Sisulu University Medical School in Mthatha. As is standard with all UCSF orthopaedic rotations, the staff at Bedford Orthopaedic Center provides feedback to residents and returns a written evaluation following completion of the elective.

Regardless of the location, UCSF residents who participate in overseas electives are exposed to a wide variety of disorders typical of developing regions. The rotation allows ample time for residents to teach local care providers and interact with local physicians. The goals for the elective, as stated in the resident training manual, are to “foster a spirit of volunteerism; enhance surgical skills and decision-making through a unique experience; provide exposure to third world disorders; further cultural sensitivity; and strengthen teaching skills.”

Materials and Methods

Study Group

The study group consisted of thirty-one orthopaedic surgeons who completed their residency training at UCSF and participated in the international elective between 2001 and 2008. The control group comprised ninety-three orthopaedic surgeons who, during the same eight-year period, graduated from residency programs where an international elective is not offered as a standard component of the residency program. These programs were Yale University, University of Pennsylvania, Stanford University, St. Mary's in San Francisco, Harvard-Massachusetts General Hospital Combined Orthopaedic Program, and Johns Hopkins University. In addition, residents in the UCSF orthopaedic surgery residency program who did not rotate overseas were included in the control group.

Survey Procedure

After receiving approval for the study protocol from the University of California at San Francisco Committee for Human Research, a survey was sent in June 2007 to graduates of the UCSF residency program and the residency directors of the above cited residency programs. Current e-mail addresses were obtained from the participating residencies and the online directory of the American Academy of Orthopaedic Surgeons. Physicians who did not respond to the first mailing received a reminder e-mail. Participants were given a $10 coffee gift certificate for completing the survey. To allow tracking of responses, return envelopes were coded with a subject identification number. Confidentiality of the responses was maintained.
Survey Instrument

Similar questionnaires were used for the two study groups. Each instrument contained a number of structured questions requesting sociodemographic information, career decision and/or practice profiles, and attitudes toward health-care delivery. Open-ended questions were also included to obtain comments regarding the UCSF international health elective. Several items were adapted from the Yale Internal Medicine survey and were used with permission. In addition to questions with nominal categories, questions were arranged with use of the format of a Likert scale, with −3 representing the strongest negative effect, 0 indicating no effect, and +3 representing the strongest positive effect. Time to complete the instrument was estimated to be between eight and ten minutes. All of the information for this study was collected from an online, self-administered survey instrument from SurveyMonkey (Portland, Oregon).

Statistical Analysis

An initial analysis was undertaken to determine the characteristics of the study cohort. Comparisons between groups were then performed with use of chi-square tests and univariate regression analysis. The level for significance was set at the conventional value of $p \leq 0.05$.

Source of Funding

In support of our research and the preparation of this manuscript, we received grants from Stryker and the National Institutes of Health. We received no payment, other benefits, or a commitment or agreement to provide such benefits, from a commercial entity.

Results

Study Participant Demographics

Sociodemographic information for the study groups is summarized in Table I. The median age of the respondents was thirty-seven years. There was no significant difference between the groups with regard to race, marital status, ethnic background, year of completion of residency, political affiliation, or area of subspecialty training. The nonparticipants were more likely to have had children during residency (39% [thirty-six of ninety-three] compared with 19% [six of thirty-one]; $p = 0.05$) and were more likely to have been born outside the United States than were the thirty-one participants (18% [seventeen] compared with 3% [one]; $p = 0.042$). No significant difference was detected between the groups with regard to domestic and international volunteer experience prior to starting residency. Approximately 68% (twenty-one) of the thirty-one participants stated that the presence of an international orthopaedic elective was not an important factor in their decision to rank the UCSF residency favorably when applying for residency. The most important reasons for participation were desire for a cross-cultural experience (29%; nine participants), the opportunity to serve a less privileged population (45%; fourteen), and a desire to obtain experience in a setting with limited resources (10%; three). Within the UCSF cohort, the most important reason for nonparticipation was family (thirteen of fifteen nonparticipants). All of the residents who participated in the elective reported that if they could do it all over, they would definitely include an international elective experience in their residency training.
### TABLE I

Sociodemographic Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participants in International Elective (N = 31)</th>
<th>Nonparticipants in International Elective (N = 93)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age*</td>
<td>35.9 ± 2.8</td>
<td>36.0 (30.0-41.0)</td>
<td>0.30</td>
</tr>
<tr>
<td>Median age*</td>
<td>36.8 ± 3.3</td>
<td>37.0 (31.0-46.0)</td>
<td></td>
</tr>
<tr>
<td>Sex†</td>
<td></td>
<td></td>
<td>0.31</td>
</tr>
<tr>
<td>Male</td>
<td>28 (90)</td>
<td>77 (83)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3 (10)</td>
<td>16 (17)</td>
<td></td>
</tr>
<tr>
<td>Race†</td>
<td></td>
<td></td>
<td>0.58</td>
</tr>
<tr>
<td>White</td>
<td>20 (65)</td>
<td>65 (70)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>1 (3)</td>
<td>8 (9)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>7 (23)</td>
<td>11 (12)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3 (10)</td>
<td>9 (10)</td>
<td></td>
</tr>
<tr>
<td>Marital status†</td>
<td></td>
<td></td>
<td>0.69</td>
</tr>
<tr>
<td>Married or partnered</td>
<td>26 (84)</td>
<td>75 (81)</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>5 (16)</td>
<td>18 (19)</td>
<td></td>
</tr>
<tr>
<td>Had children during residency†</td>
<td></td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>No</td>
<td>25 (81)</td>
<td>57 (61)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6 (19)</td>
<td>36 (39)</td>
<td></td>
</tr>
<tr>
<td>Had children after residency†</td>
<td></td>
<td></td>
<td>0.75</td>
</tr>
<tr>
<td>No</td>
<td>14 (45)</td>
<td>39 (42)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>17 (55)</td>
<td>54 (58)</td>
<td></td>
</tr>
<tr>
<td>Born in the United States†</td>
<td></td>
<td></td>
<td>0.042</td>
</tr>
<tr>
<td>No</td>
<td>1 (3)</td>
<td>17 (18)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30 (97)</td>
<td>76 (82)</td>
<td></td>
</tr>
<tr>
<td>Domestic volunteer prior to residency†</td>
<td></td>
<td></td>
<td>0.82</td>
</tr>
<tr>
<td>No</td>
<td>9 (29)</td>
<td>25 (27)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22 (71)</td>
<td>68 (73)</td>
<td></td>
</tr>
</tbody>
</table>

*The values are given as the age in years and the standard deviation, with the range in parentheses.
†The values are given as the number of respondents, with the percentage in parentheses.
Attitudes Toward Health-Care Delivery

We examined respondent attitudes toward health care in developing countries in terms of physician practice and medical training. Participants were more likely than nonparticipants to believe that physicians have an obligation to the medically underserved (55% [seventeen of thirty-one] compared with 35% [thirty-three of ninety-three]; p = 0.017). Participants were more likely to believe that residency training should include exposure to health care in the developing world (100% [thirty-one] compared with 65% [sixty]; p = 0.0001). Finally, more of the participants reported a commitment to treating indigent patients in their medical practice (68% [twenty-one] compared with 36% [thirty-four]; p = 0.013).

The respondents' opinions regarding the use of health-care resources in the United States were also evaluated. Both participants and nonparticipants believed that physicians in the United States underutilize the physical examination. Participants were more likely to believe that physicians in the United States overuse sophisticated diagnostic tests such as magnetic resonance imaging and computed tomography scans (52% [sixteen of thirty-one] compared with 19% [eighteen of ninety-three]; p = 0.0068). Additionally, participants were more likely to rate alternative medicine practices as useful for treating musculoskeletal disorders. Participants more frequently endorsed acupuncture (p = 0.02), herbal remedies (p = 0.0028), yoga (p = 0.017), and folk medicine (p = 0.034) as useful adjuvant treatments for orthopaedic disorders.

Impact on Postresidency Volunteer Activities

Participants were more likely to consider volunteering internationally in the future than were nonparticipants. Most importantly, 19% (six) of the thirty-one participants had participated in additional international trips since the completion of residency compared with 6% (six) of the ninety-three nonparticipants (p = 0.05). Participants were also more likely to engage in domestic volunteer efforts than were nonparticipants (58% [eighteen of thirty-one] compared with 26% [twenty-four of ninety-three]; p = 0.048) (Table II). A univariate logistic regression analysis was performed with the primary outcome of international or domestic volunteerism following residency. International elective participation was a strong predictor of future volunteerism (odds ratio, 3.1; 95% confidence interval, 1.32 to 7.1; p < 0.05).
TABLE II
Impact on Postresidency Volunteer Activities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participants in International Elective (N = 31)</th>
<th>Nonparticipants in International Elective (N = 93)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postresidency volunteerism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International volunteer experience</td>
<td>6 (19)</td>
<td>6 (6)</td>
<td>0.05</td>
</tr>
<tr>
<td>Domestic volunteer experience</td>
<td>18 (58)</td>
<td>24 (26)</td>
<td>0.048</td>
</tr>
<tr>
<td>Importance of providing charity care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residency should include exposure to health care in the developing world</td>
<td>31 (100)</td>
<td>60 (65)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Orthopaedic surgeons in practice should provide care to the medically indigent</td>
<td>21 (68)</td>
<td>34 (36)</td>
<td>0.013</td>
</tr>
<tr>
<td>Health care practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overutilization of computed tomography and magnetic resonance imaging in the U.S.</td>
<td>16 (52)</td>
<td>18 (19)</td>
<td>0.0068</td>
</tr>
</tbody>
</table>

*The values are given as the number of respondents, with the percentage in parentheses.

Discussion

The importance of sending physicians-in-training abroad to enhance medical training is not a novel idea. A 1969 editorial in *The Journal of the American Medical Association* stated, “If, as a routine, young American doctors were encouraged to spend some months working in a developing country before they become tied to the responsibilities of practice, the result could only be better medicine at home and abroad.” International electives benefit not only the residents who participate but also the residency program. Such electives promote several of the core competencies put forward by the Accreditation Council for Graduate Medical Education, including professionalism, patient care, medical knowledge, practice-based learning, interpersonal and communication skills, and system-based practice. In recent years, there has been considerable interest in introducing more formal methods of teaching professionalism in orthopaedic residency. John Racy, in an essay on professionalism, suggested that “[a] profession is a socially sanctioned activity whose primary object is the well being of others above the professional's personal gain.” Professionalism is most commonly taught in residency through modeling, whereby mentors provide examples of moral and virtuous behavior. Given the heavy workloads facing orthopaedic surgeons in training, residents often focus their efforts on acquiring the knowledge and skills necessary to provide technically sound medical care at the expense of other core competencies such as professionalism. Experiences abroad can inspire residents, encourage professionalism, and help residents to hone their patient care and communication skills.
Along with professionalism, providing culturally competent care has emerged as a central educational goal of orthopaedic residency training programs. Such care requires tailoring the delivery of high-quality medical care to the social, cultural, and linguistic needs of the patient\textsuperscript{13}. International electives expose residents to different cultures and offer opportunities to approach orthopaedic problems in a culturally sensitive manner. While working alongside local physicians, residents witness the way in which host orthopaedic surgeons tailor their care to meet the needs of their patients. Many orthopaedic surgery residency programs provide rotations in inner city hospitals where residents are exposed to indigent patients and patients from a variety of ethnic backgrounds. While these experiences may have a similar impact on residents in training, the pathology, level of poverty, and resources are not the same.

The UCSF orthopaedic residency program incorporated the international elective into its curriculum with the hope that early exposure would have a lasting impact on the practice habits, beliefs, and subsequent volunteer efforts of the residents who participated. Our quantitative and qualitative data suggest that international health experiences may play a positive and influential role in the education of residents. The participants were more likely than nonparticipants to volunteer, both internationally and domestically, following the completion of residency. Furthermore, participants were more likely to believe that practicing medicine in a developing country is a rewarding experience that should be included in residency training programs.

As noted in the Results section, residents who participated in the international orthopaedic elective were also more likely to believe that sophisticated imaging modalities are often overutilized in the United States. Given the current health-care budget crisis and dire need to curb health-care costs, reducing the unnecessary use of imaging tests may help to accomplish this goal. Additionally, residents who completed the elective were more likely to endorse alternative medicine practices, including yoga, acupuncture, herbal remedies, and folk medicine, as a useful complement to traditional western medicine for treatment of musculoskeletal disorders. Whether such alternative medicine increases or decreases medical costs overall, and whether the cost burden of such treatments should be covered by the patient or the insurer, are topics that merit further research and discussion.

Studies supporting the position that training programs influence physicians, especially in terms of future career decisions, have been criticized for failing to account for preexisting characteristics of the residents\textsuperscript{14,15}. The potential for selection bias in the current study was addressed in several ways. First, we found that the participants and nonparticipants demonstrated no significant difference with regard to basic demographic variables, including age, marital status, number of children, and political affiliation, although nonparticipants were more likely to have children and to have been abroad. The two groups were equivalent with regard to exposure to domestic and international volunteerism prior to starting residency, suggesting that the baseline interest in volunteerism was similar between the two groups of residents. We also found that the majority of participants indicated that the international elective did not influence how they ranked UCSF when applying for residency, again suggesting that the UCSF residents are not necessarily more interested in international volunteerism prior to residency. Finally, the assignment of residency programs by a match system limits the free choice of each resident, thereby further mitigating the impact of selection bias.

Despite the fact that both study groups appeared to enter residency with an equivalent level of interest in volunteerism, those who choose to participate in an overseas rotation will always be a self-selected group and, thus, selection bias will exist in any study of the impact of international training on future physicians. The only way to eliminate this potential bias would be to randomly assign residents to an international rotation. Such a study, in which an international elective is imposed on residents without regard to the desire to participate in such training, would be fraught with difficulties. Specifically, students who travel to impoverished overseas locations expose themselves to potential health risks such as malaria, human immunodeficiency virus, and hepatitis C. Furthermore, many residents are forced to...
leave behind their families for an extended period of time. The likelihood of a medical school administration and the human subjects committee agreeing to mandate such an experience is therefore low.

In addition to this selection bias, the other important limitations of our study stem from reporter bias and the limitations surrounding generalizing the results to residents from other training programs. As with any survey, reporter bias may have existed. For this reason, our results focus largely on objective variables rather than on subjective experiences and beliefs. We also recognize that the response rates between the groups were markedly different. While 100% of the UCSF overseas elective participants responded, we cannot accurately calculate the response rate of the nonparticipants. Citing privacy concerns, the residency programs sent surveys directly to their graduates, a pool of 312 possible residents, from whom we received seventy-eight responses (a response rate of ≥25%). The differing response rates of the participants and nonparticipants, along with the finding that nonresponders were more likely to be nonparticipants, may impact our statistical analysis. Furthermore, given the unique components of the residency training program, the institution, and the study period, our findings may not be generalizable to other populations. With time, as more programs incorporate international electives into their curricula, a multicenter study evaluating the experience of residents from across the country could help to address the issues of reporter bias and generalizability.

Despite the limited scope of the current study, our findings point to an association between exposure to international electives and postresidency volunteer efforts. While it is possible that our study merely reflects inherent differences between the study groups, it appears that the differences we found stem at least in part from the influence of the elective. If we assume that the elective does have an impact, whether the elective inspires new interest or affirms and reinforces residents' inherent interests is of secondary importance. It has been shown that idealism and the desire to work with underserved populations wane as medical students progress from preclinical training through residency. Whether the participants represent residents who have a strong inherent interest in charity care, those who completed the elective were more likely to go on to volunteer after residency both within the United States and in the developing world. They were also more likely to endorse a commitment to serving indigent patients in their practice, an attitude which has been shown to be in steep decline with the recent increased penetration of managed care plans.

Eight years after it was created, the international elective at UCSF has become the longest standing international orthopaedic elective of its kind in the United States. It is routinely described by past residents as the most valuable month of their residency training. The success of the program is best expressed in the words of the residents themselves. One of the residents surveyed reflected: “I realized that one doesn't have to travel halfway around the globe to find people who are desperately in need. I began to volunteer at a drop-in clinic for the homeless located in the worst part of downtown. The problems of isolation, hopelessness, lack of education, and cultural/behavioral barriers are very similar. I hope to engage in volunteer work of some kind after residency ends, not just for purely altruistic reasons, but also because I firmly believe that it helps me to become a more effective physician.”

Currently, there is unprecedented interest in global health among orthopaedic surgeons. International electives may reinforce this interest among surgeons in training and, as demonstrated by this study, inspire participation in global efforts throughout their professional careers.

Notes

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Investigation performed at the Department of Orthopaedic Surgery, University of California at San Francisco School of Medicine, San Francisco; Institute for Global Orthopaedics and Traumatology, San Francisco; and the Biostatistics, Research Ethics, and Design Program, Clinical and Translational Institute, University of California at San Francisco, San Francisco, California

References


Integration of Surgical Residency Training With US Military Humanitarian Missions.

Jensen S¹, Tadlock MD², Douglas T³, Provencher M⁴, Ignacio RC Jr⁵.

Abstract

OBJECTIVE: To describe how the US Navy integrates surgical resident training during hospital ship-based humanitarian activities and discuss the potential operative and educational benefits during these missions.

DESIGN: Retrospective review of predeployment surgical plans, operative case logs, and after-action reports from United States Naval Ship (USNS) Mercy humanitarian deployments from 2006 to 2012.

SETTING: The USNS Mercy hospital ship.

PARTICIPANTS: We enrolled 24 surgical residents from different surgical specialties including general surgery, obstetrics and gynecology, urology, otolaryngology, and ophthalmology.

RESULTS: During 4 planned deployments (2006-2012), 2887 surgical procedures were performed during 20 humanitarian missions conducted by the USNS Mercy in 9 different Southeast Asian countries. Of all the general surgery eligible procedures performed, 1483 (79%) were defined categories under the current general surgery Accreditation Council for Graduate Medical Education guidelines, including abdominal (31%); skin, soft tissue, and breast (21%); ear, nose, and throat (20.5%); plastic surgery (15.5%); and pediatric (12%) cases. The number of surgical cases completed by each resident ranged from 30 to 67 cases over a period of 4 to 6 weeks during the overseas humanitarian rotation.

CONCLUSIONS: The US Navy's humanitarian experience provides a unique educational opportunity for young military surgeons to experience various global health systems, diverse cultures, and complex logistical planning without sacrificing the breadth and depth of surgical training. This model may provide a framework to develop future international electives for other general surgery training programs.

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KEYWORDS: Interpersonal and Communication Skills; Medical Knowledge; Patient Care; Systems-Based Practice; USNS Mercy; hospital ship; humanitarian assistance; navy; surgical residency; surgical volunteerism

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[Indexed for MEDLINE]
Are American Surgical Residents Prepared for Humanitarian Deployment?: A Comparative Analysis of Resident and Humanitarian Case Logs.

Lin Y, Dahm JS, Kushner AL, Lawrence JP, Trelles M, Dominguez LB, Kuwayama DP.

Abstract

BACKGROUND: Effective humanitarian surgeons require skills in general surgery, OB/GYN, orthopedics, and urology. With increasing specialization, it is unclear whether US general surgery residents are receiving exposure to these disparate fields. We sought to assess the preparedness of graduating American surgical residents for humanitarian deployment.

METHODS: We retrospectively analyzed cases performed by American College of Graduate Medical Education general surgery graduates from 2009 to 2015 and cases performed at select Médecins Sans Frontières (MSF) facilities from 2008 to 2012. Cases were categorized by specialty (general surgery, orthopedics, OB/GYN, urology) and compared with Chi-squared testing. Non-operative care including basic wound and drain care was excluded from both data sets.

RESULTS: US general surgery residents performed 41.3% MSF relevant general surgery cases, 1.9% orthopedic cases, 0.1% OB/GYN cases, and 0.3% urology cases; the remaining 56.4% of cases exceeded the standard MSF scope of care. In comparison, MSF cases were 30.1% general surgery, 21.2% orthopedics, 46.8% OB/GYN, and 1.9% urology. US residents performed fewer OB/GYN cases (p < 0.01) and fewer orthopedic cases (p < 0.01). Differences in general surgery and urology caseloads were not statistically significant. Key procedures in which residents lacked experience included cesarean sections, hysterectomies, and external bony fixation.

CONCLUSION: Current US surgical training is poorly aligned with typical MSF surgical caseloads, particularly in OB/GYN and orthopedics. New mechanisms for obtaining relevant surgical skills should be developed to better prepare American surgical trainees interested in humanitarian work.

Comment in

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Ethics of surgical training in developing countries.

Ramsey KM, Weijer C.

Author information

Abstract
The practice of surgical trainees operating in developing countries is gaining interest in the medical community. Although there has been little analysis about the ethical impact of these electives, there has been some concerns raised over the possible exploitation of trainees and their patients. An ethical review of this practice shows that care needs to be taken to prevent harm. Inexperienced surgeons learning surgical skills in developing countries engender greater risk of violating basic ethical principles. Advanced surgical trainees who have already achieved surgical competence are best qualified to satisfy these ethical issues. All training programs need to develop a structured ethical review for international electives to protect their trainees and their patients from harm.

Comment in
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Abstract

Global surgery, while historically a small niche, is becoming a larger part of the global health enterprise. This article discusses the burden of global surgery, emphasizing the importance of addressing surgical needs in low- and middle-income countries. It describes the barriers to surgical care in the developing world, the ethical challenges that these barriers create, and strategies to overcome these barriers. It emphasizes the crucial role of preparation for global surgical interventions as a way to maximize benefits as well as minimize harms and ethical challenges. It ends with the cautionary statement that preparation does not eliminate ethical problems, so surgical volunteers must be prepared not only for the technical challenges of global surgery but also for the ethical challenges.

Keywords

Club Foot  Female Genital Mutilation  Ethical Challenge  Host Community  Obstetric Fistula

These keywords were added by machine and not by the authors. This process is experimental and the keywords may be updated as the learning algorithm improves. This is a preview of subscription content, log in to check access.

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The author has no conflicts of interest to disclose.

References

   PubMedCentral (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3099562)
   CrossRef (https://doi.org/10.2471/BLT.11.088229)

   CrossRef (https://doi.org/10.1016/S0140-6736(09)60332-9)

   CrossRef (https://doi.org/10.1001/jama.2012.158)

   CrossRef (https://doi.org/10.1016/j.jpedsurg.2013.03.045)


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CrossRef (https://doi.org/10.1016/j.surg.2012.09.014)


CrossRef (https://doi.org/10.1007/s10730-011-9155-8)


PubMedCentral (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3608959)


CrossRef (https://doi.org/10.1136/medethics-2012-100610)


CrossRef (https://doi.org/10.1007/s00268-012-1885-5)

Plast Reconstr Surg 113:433–435
CrossRef (https://doi.org/10.1097/01.PRS.0000097680.73556.A3)

CrossRef (https://doi.org/10.1001/archsurg.2012.696)

PubMedCentral (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3432397)


Google Scholar (http://scholar.google.com/scholar_lookup?title=Questioning%20the%20universality%20of%20medical%20ethics%3A%20dilemmas%20raised%20performing%20surgery%20around%20the%20globe&author=AD.%20Rose&journal=The%20Hastings%20Center%20Report&volume=41&issue=5&pages=18-21&publication_year=2011)


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