AAOS
American Academy of Orthopaedic Surgeons

APPROPRIATE USE CRITERIA FOR TREATMENT OF DISTAL RADIUS FRACTURES

Adopted by the American Academy of Orthopaedic Surgeons Board of Directors

March 18, 2013

Disclaimer

Volunteer physicians from multiple medical specialties created and categorized these Appropriate Use Criteria. These Appropriate Use Criteria are not intended to be comprehensive or a fixed protocol, as some patients may require more or less treatment or different means of diagnosis. These Appropriate Use Criteria represent patients and situations that clinicians treating or diagnosing musculoskeletal conditions are most likely to encounter. The clinician's independent medical judgment, given the individual patient's clinical circumstances, should always determine patient care and treatment.

Disclosure Requirement

In accordance with American Academy of Orthopaedic Surgeons policy, all individuals whose names appear as authors or contributors to this document filed a disclosure statement as part of the submission process. All authors provided full disclosure of potential conflicts of interest prior to participation in the development of these Appropriate Use Criteria. Disclosure information for all panel members can be found in Appendix C.

Funding Source

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FDA Clearance

Some drugs or medical devices referenced or described in this document may not have been cleared by the Food and Drug Administration (FDA) or may have been cleared for a specific use only. The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or device he or she wishes to use in clinical practice.

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Julie E. Adams, MD, MS
American Academy of Orthopaedic Surgeons

Brett D. Crist, MD, FAAOS, FACS
Orthopaedic Trauma Association

Charles A. Goldfarb, MD
American Society of Surgery of the Hand

John J. McGraw, MD
American Academy of Orthopaedic Surgeons

Miguel Pirela-Cruz, MD, FACS
American Association for Hand Surgery

David C. Ring, MD, PhD
American Society for Surgery of the Hand

Jaiyoung Ryu, MD
American Association for Hand Surgery

Paul Tornetta, III, MD
Orthopaedic Trauma Association

TREATMENT OF DISTAL RADIUS FRACTURES AUC REVIEW PANEL

Jeffrey E. Budoff, MD
American Society for Surgery of the Hand

Peter J. Evans, MD, PhD
American Society for Surgery of the Hand
American Association for Hand Surgery
American Association of Hip and Knee Surgeons

Daren Forward, MD, FRCS
American Society for Surgery of the Hand

Jeffrey B. Friedrich, MD, FACS
American Society of Plastic Surgeons

M. Felix Freshwater, MD
American College of Occupational and Environmental Medicine

Kenneth Koval, MD
American Society for Surgery of the Hand

Donald H. Lee, MD
American Society for Surgery of the Hand

Jose J. Monsivais, MD, FACS
American Society for Surgery of the Hand

Jay Pomerance, MD
American Society for Surgery of the Hand

J. Andrew Trenholm, MD, FRCSC
American Society for Surgery of the Hand
Orthopaedic Trauma Association

Boris A. Zelle, MD
Orthopaedic Trauma Association
American Academy of Orthopaedic Surgeons

Dan A. Zlotolow, MD
American Society for Surgery of the Hand

TREATMENT OF DISTAL RADIUS FRACTURES AUC VOTING PANEL

Alan M. Adelman, MD, MS
American Academy of Family Physicians

Henry Backe, MD
American Association of Hip and Knee Surgeons

George W. Balfour, MD
American Academy of Orthopaedic Surgeons

Warren C. Hammert, MD
American Society for Surgery of the Hand

Robert Charles Kramer, MD
American Academy of Orthopaedic Surgeons

David “Dirk” Leu, MD
Pediatric Orthopaedic Society of North America

Peter Stern, MD
American Society for Surgery of the Hand

Steven Strode, MD, MPH, Med
American Academy of Family Physicians

Walter H. Truong, MD
Pediatric Orthopaedic Society of North America

VOTING PANEL ROUND TWO DISCUSSION MODERATORS

William C. Watters, III, MD

James O. Sanders, MD

AUC SECTION LEADER

William C. Watters III, MD

AAOS AUC SECTION

Joseph A. Bosco III, MD

Brent Graham, MD

Michael H. Heggeness, MD

Michael Warren Keith, MD

Charles T. Mehlman, DO, MPH

COMMITTEE ON EVIDENCE-BASED QUALITY AND VALUE CHAIR

David S. Jevsevar, MD, MBA

COUNCIL ON RESEARCH AND QUALITY CHAIR

Kevin J. Bozic, MD, MBA

AAOS STAFF

Deborah Cummins PhD
Director of Research and Scientific Affairs
Phone: (847) 384-4326
E-mail: cummins@aaos.org

Jayson Murray MA
Manager, Evidence-Based Medicine Unit
Phone: (847) 384-4316
E-mail: jmurray@aaos.org

William Martin, III, MD
Medical Director

Nilay Patel, MA
Lead Research Analyst

Anne Woznica MLS
Medical Librarian

Leeaht Gross MPH
Evidence-Based Medicine Coordinator

Yasseline Martinez
Evidence-Based Medicine Administrative Assistant

Former Staff:
Kevin Boyer, MPH

I. INTRODUCTION

OVERVIEW

The American Academy of Orthopaedic Surgeons (AAOS) has developed these Appropriate Use Criteria (AUC) to determine appropriateness of Treatment for Distal Radius Fractures. An "appropriate" healthcare service is one for which the expected health benefits exceed the expected negative consequences by a sufficiently wide margin.[1] Evidence-based information, in conjunction with the clinical expertise of physicians from multiple medical specialties, was used to develop the criteria in order to improve patient care and obtain the best outcomes while considering the subtleties and distinctions necessary in making clinical decisions. The foundation for this AUC is the 2009 Treatment of Distal Radius Fractures Clinical Practice Guideline which can be accessed via the following link: http://www.aaos.org/research/guidelines/drfguideline.pdf.

The purpose of the AUC is to help determine the appropriateness of clinical practice guideline recommendations for the heterogeneous patient population routinely seen in practice. The best available scientific evidence is synthesized with collective expert opinion on topics where gold standard randomized clinical trials are not available or are inadequately detailed for identifying distinct patient types. When there is evidence corroborated by consensus that expected benefits substantially outweigh potential risks exclusive of cost, a procedure is determined to be appropriate. The AAOS uses the RAND/UCLA Appropriateness Method (RAM).[1] Our process includes these steps: reviewing the results of the evidence analysis, compiling a list of clinical vignettes, and having an expert panel comprised of representatives from multiple medical specialties determine the appropriateness of each of the clinical indications for treatment as "Appropriate," "May be Appropriate," or "Rarely Appropriate."

To access an intuitive and more user-friendly version of the appropriate use criteria for this topic online, please use our AUC web-based application at www.aaos.org/aucapp.

These criteria should not be construed as including all indications or excluding indications reasonably directed to obtaining the same results. The criteria intend to address the most common clinical scenarios facing all appropriately trained surgeons and all qualified physicians managing patients under consideration for treatment of distal radius fractures. The ultimate judgment regarding any specific criteria should address all circumstances presented by the patient and the needs and resources particular to the locality or institution. It is also important to state that these criteria were developed as guidelines and are not meant to supersede clinician expertise and experience or patient preference.

INTERPRETING THE APPROPRIATENESS RATINGS

To prevent misuse of these criteria, it is extremely important that the user of this document understands how to interpret the appropriateness ratings. The appropriateness rating scale ranges from one to nine and there are three main range categories that determine how the median rating is defined (i.e. 1-3 = "Rarely Appropriate", 4-6 = "May Be Appropriate", and 7-9 = "Appropriate"). Before these appropriate use criteria are consulted, the user should read through and understand all contents of this document.

PATIENT POPULATION
This document addresses the treatment of acute distal radius fracture in adults (defined as patients 19 years of age and older).

ETIOLOGY
Fracture of the distal radius is the result of trauma. There is a bimodal distribution of distal radius fractures where high-energy fractures occur in younger persons (predominately male) and high and low-energy fractures occur in older persons (Predominately female).[2, 3]

INCIDENCE
Distal radius fracture is one of the most common fractures seen by orthopaedic surgeons, with an incidence of 195.2/100,000 persons per year.[3]

BURDEN OF DISEASE
As one of the most common fractures seen by orthopaedic surgeons, distal radius fractures result in significant financial burden. Costs related to distal radius fractures are mostly service related and at least $164,000,000 was spent on hospitalizations related to distal radius fractures in 2007.[4,5]

EMOTIONAL AND PHYSICAL IMPACT
Acute distal radius fracture results in pain, tenderness, swelling and potential deformity. Patients may be faced with substantial morbidity if fracture healing is delayed or results in clinically significant deformity. Additionally, there are known complications in the treatment of distal radius fracture. The recovery period for distal radius fracture can be substantial and the impact of the method of fixation on activities and daily living can be significant.

POTENTIAL BENEFITS, HARMS, AND CONTRAINDICATIONS
The aim of treatment is pain relief and maintenance of the patient's functional status. Most treatments are associated with some known risks, especially invasive and operative treatments. In addition, contraindications vary widely based on the treatment administered. Therefore, discussion of available treatments and procedures applicable to the individual patient rely on mutual communication between the patient and physician, weighing the potential risks and benefits for that patient.

II. METHODS

These AUC for Treatment of Distal Radius Fractures are based on a review of the available literature regarding treatment of distal radius fractures and a list of clinical scenarios (i.e. criteria) constructed and voted on by experts in orthopaedic surgery and other relevant medical fields. This section describes the methods adapted from the RAND/UCLA Appropriateness Method (RAM).[1] This section also includes the activities and compositions of the various panels that developed, defined, reviewed, and voted on the criteria.

Members of the Treatment of Distal Radius Fractures AUC Writing Panel developed a list of 240 patient scenarios and 10 treatments. The Treatment of Distal Radius Fractures AUC Review Panel reviewed these scenarios and treatments independently to ensure that they were representative of patients and scenarios clinicians are likely to encounter. The Treatment of Distal Radius Fractures Voting Panel participated in two rounds of voting. During the first round of voting, the voting panel was given approximately one month to independently rate the appropriateness of the 10 treatments for the 240 patient scenarios as 'Appropriate', 'May Be Appropriate', or 'Rarely Appropriate' via an electronic ballot. After the first round of appropriateness ratings were submitted, AAOS staff calculated the median ratings for each patient scenario and specific treatment. Three one and a half hour conference calls were held on January 6th, 14th, and 17th, of 2013 with participating Voting Panel members to address the scenarios/treatments which resulted in disagreement (definition of disagreement can be found in Table 3). After this discussion, the second round of electronic voting occurred. The Voting Panel determined appropriateness by rating scenarios (i.e. criteria) as 'Appropriate', 'May Be Appropriate', or 'Rarely Appropriate'. There was no attempt to obtain consensus about appropriateness.

AAOS Appropriate Use Criteria Section, the AAOS Council on Research and Quality, and the AAOS Board of Directors sequentially approved the Appropriate Use Criteria for Treatment of Distal Radius Fractures. AAOS submits AUC to the National Guidelines Clearinghouse and in accordance with the National Guidelines Clearinghouse criteria will update or retire this AUC every five years.

DEVELOPING CRITERIA

Members of the Treatment of Distal Radius Fractures AUC Writing Panel, who are orthopaedic specialists in treatment of distal radius fractures, developed clinical scenarios using the following guidelines:

- Include a broad spectrum of patients that may be eligible for treatment of distal radius fractures *[comprehensive]*
- Classify patients into a unique scenario *[mutually exclusive]*
- Consistently classify similar patients into the same scenario *[reliable, valid indicators]*

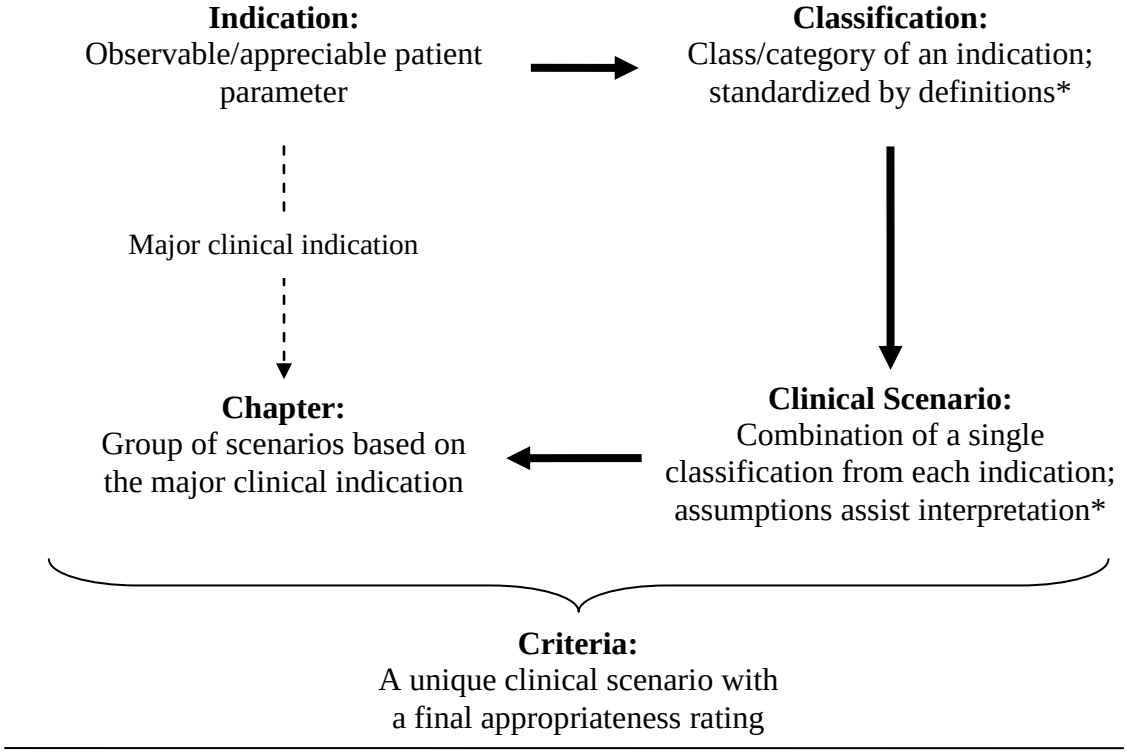
The Writing Panel developed the scenarios by categorizing patients in terms of indications evident during the clinical decision making process (Figure 1). These scenarios relied upon definitions and general assumptions, mutually agreed upon by the Writing Panel during the development of the scenarios. These definitions and assumptions were necessary to provide

consistency in the interpretation of the clinical scenarios among experts voting on the scenarios and readers using the final criteria.

FORMULATING INDICATIONS AND SCENARIOS

The scenarios began development with the Treatment of Distal Radius Fractures AUC Writing Panel identifying clinical indications typical of patients commonly presenting for treatment of distal radius fractures in clinical practice. Indications are most often parameters observable by the clinician, including symptoms or results of diagnostic tests. Additionally "human factor" (e.g. activity level) or demographic variables can be considered.

Figure 1. Developing Criteria



Indications identified in clinical trials (derived from patient selection criteria) included in AAOS Clinical Practice Guidelines served as a starting point for the Treatment of Distal Radius Fractures AUC Writing Panel and ensured that these Appropriate Use Criteria referred to the evidence base for the Treatment of Distal Radius Fractures AUC. The Writing Panel considered this initial list and other indications based on their clinical expertise and selected the most clinically relevant indications (Table 1). The Writing Panel then defined distinct classes for each indication in order to stratify/categorize the indication (Table 1).

The Writing Panel organized these indications into a matrix of clinical scenarios (Appendix B) that addressed all combinations of the classifications. The Writing Panel was given the opportunity to remove any scenarios that never occur in clinical practice; however, they agreed that all 240 scenarios could present themselves in clinical practice, thus no scenarios were

removed. The major clinical decision making indications chosen by the Writing Panel divided the matrix of clinical scenarios into chapters. AO fracture type, mechanism of injury, functional demands, ASA status, and associated injuries served as the major clinical decision making indications for the chapters presented in Table 1.

CREATING DEFINITIONS AND ASSUMPTIONS

The Treatment of Distal Radius Fractures AUC Writing Panel constructed concise and explicit definitions for the indications and classifications. This standardization helped ensure that how the Writing Panel defined AO fracture types, mechanisms of injury, functional demands, ASA statuses, and associated injuries was consistent among those reading the clinical scenario matrix or the final criteria. Definitions drew explicit boundaries when possible and were based on standard medical practice or existing literature.

Additionally, the Writing Panel formulated a list of general assumptions in order to provide more consistent interpretations of a scenario. These assumptions differed from definitions in that they identified circumstances that exist outside of the control of the clinical decision making process. Examples of such can be the assumption that diagnostic exams were appropriately conducted (x-rays, labs) or that mitigating factors do not complicate clinical scenarios (e.g. do not resuscitate, non-compliance). Assumptions also addressed the use of existing published literature regarding the effectiveness of treatment and/or the procedural skill level of physicians. Additionally, assumptions highlighted intrinsic methods described in this document such as the role of cost considerations in rating appropriateness or the validity of the definition of appropriateness. The main goal of assumptions was to focus scenarios so that they apply to the average patient presenting to an average physician at an average facility.[1]

The definitions and assumptions provided all readers with a common starting point in interpreting the clinical scenarios. This list of definitions and assumptions accompanied the matrix of clinical scenarios in all stages of the development of this AUC and appears in the Definitions and Assumptions section.

VOTING PANEL MODIFICATIONS TO WRITING PANEL MATERIALS

The original indications table constructed by the Writing Panel was modified by the Voting Panel during the round two discussions. The original list of associated injuries created by the Writing Panel included carpus injuries; however, it was the consensus of the Voting Panel to remove all patient scenarios which included “Carpus Injuries” as an indication. The rationale behind this decision was that, as Voting Panel members, they would need much more information concerning the carpus injury to properly rate the appropriateness of treatment for the distal radius fracture.

The Voting Panel also agreed to amend the original indication labeled, “Open Wound”, as they expressed concern about rating a treatment for a patient presenting with an open wound without knowing whether that open wound was a Grade I, II, or III open fracture as defined by the Gustilo Open Fracture Classification. The Voting Panel separated the patient scenarios reflecting high-energy fractures into two categories: Grade I or II versus Grade III open fractures. Patient scenarios reflecting low-energy fractures and open wounds were specified as having a Grade I or II open fracture.

The final modification to the indications was the deletion of ASA Status 5 from the indications list. The original scenarios were grouped by ASA 1-3 and ASA 4-5, the revised groupings are ASA 1-3 and ASA 4. The rationale behind the deletion of ASA 5 was that treatment for a distal radius fracture in a moribund patient would be unnecessary.

Additionally the Voting Panel agreed to add two new assumptions concerning open fractures to the assumptions list. Assumptions 13 and 14 were added by the Voting Panel during the round two discussions.

Table 1. Indications and Classifications

Indication	Classification(s)
AO/OTA Fracture Type	**A** **B** **C**
Mechanism of Injury	**High energy** **Low Energy**
Functional Demands	**Homebound** **Independent** **Normal** **High**
ASA Status (co-morbidities)	**ASA 1-3** **ASA 4**
Associated Injuries	**No associated injuries** **Grade I or II Open Fracture** **Grade III Open Fracture** **Median Nerve Injury** **Other Ipsilateral Injury**

LITERATURE REVIEW

Concurrent with the Writing Panel developing the criteria, the AAOS Appropriate Use Criteria Unit undertook a literature review based on the results of the AAOS clinical practice guideline and all literature published after the release of the clinical practice guideline related to the treatment of distal radius fractures. This literature review informed the decisions relevant to the indications identified by the Writing Panel when they were available and necessary. The literature review also considered lower quality evidence when the best available evidence (i.e. randomized control trials) did not contain information relevant to the clinical scenarios. The full results of the literature review appear in the Literature Review Findings section.

REVIEWING SCENARIOS

After the Writing Panel developed the scenarios, the Treatment of Distal Radius Fractures AUC Review Panel reviewed the proposed chapters in order to ensure that they were representative of patients and scenarios clinicians are likely to encounter. The Review Panel was comprised of

orthopaedic surgeons who routinely perform treatments for distal radius fractures and other specialties who may refer patients with distal radius fractures to a specialist. No member of this panel participated in the Writing Panel's initial development of the scenarios or participated in the appropriateness rating of the scenarios.

Review Panel members considered the lists of scenarios, definitions, assumptions and the literature review associated with each scenario. Each independent reviewer suggested to the Writing Panel, potential modifications to the content or structure of the lists and literature review. The Writing Panel provided final determination of modifications to the indications, scenarios, assumptions and literature review.

DETERMINING APPROPRIATENESS

TREATMENT OF DISTAL RADIUS FRACTURES AUC VOTING PANEL

A multidisciplinary panel of clinicians assembled to determine the appropriateness of treatments for distal radius fractures. This group consisted of approximately 50% specialists and 50% generalists. Two non-voting moderators who are orthopaedic surgeons but are not specialists in treatment of distal radius fractures facilitated the Voting Panel. The moderators were familiar with the methods and procedures of AAOS Appropriate Use Criteria and led the panel (as non-voters) in discussions. Additionally, no member of the voting panel was involved in the development (Writing Panel) or independent review (Review Panel) of the scenarios.

The Voting Panel used a modified Delphi procedure to determine appropriateness ratings. The Voting Panel participated in two rounds of voting while considering evidence-based information provided in the literature review. While cost is often a relevant consideration, panelists focused their appropriateness ratings on the effectiveness of treatment for distal radius fractures.

RATING APPROPRIATENESS

When rating the appropriateness of a scenario, the Voting Panel considered the following definition:

> "An appropriate treatment for distal radius fractures is one for which the treatment **is** generally acceptable, **is** a reasonable approach for the indication, and **is** likely to improve the patient's health outcomes or survival."

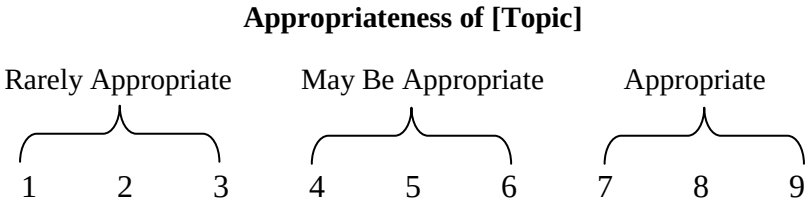
They then rated each scenario **using their best clinical judgment, taking into consideration the available evidence, for an average patient presenting to an average physician at an average facility** as follows:

Table 2. Appropriateness Ratings

Rating	Explanation
7-9	**Appropriate**: Appropriate for the indication provided, meaning treatment **is** generally acceptable and **is** a reasonable approach for the indication and **is** likely to improve the patient's health outcomes or survival.

4-6	**May Be Appropriate**: Uncertain for the indication provided, meaning treatment **may** be acceptable and **may** be a reasonable approach for the indication, but with uncertainty implying that more research and/or patient information is needed to further classify the indication.
1-3	**Rarely Appropriate**: Rarely an appropriate option for management of patients in this population due to the lack of a clear benefit/risk advantage; rarely an effective option for individual care plans; exceptions should have documentation of the clinical reasons for proceeding with this care option (i.e. procedure is not generally acceptable and is not generally reasonable for the indication).

Each panelist uses the scale below to record their response for each scenario:



ROUND ONE VOTING

The first round of voting occurred after completion of the independent review of the scenarios by the Review Panel and approval of the final indications, scenarios, and assumptions by the Writing Panel. The Voting Panel rated the scenarios electronically using a personalized ballot created by AAOS staff using SNAP 10 Survey Software. There was no interaction between panel members while completing the first round of voting. Panelists considered the following materials:

- The instructions for rating appropriateness
- The completed literature review, that is appropriately referenced when evidence is available for a scenario
- The list of indications, definitions and assumptions, to ensure consistency in the interpretation of the clinical scenarios

ROUND TWO VOTING

The second round of voting occurred after a series of 3 conference calls, which were led by a non-voting moderator. Before the discussions, each panelist received a personalized document that included their first round ratings along with summarized results of the first-round ratings that resulted in disagreement. These results indicated the frequency of ratings for a scenario for all panelists. The document contained no identifying information for other panelists' ratings. The moderator also used a document that summarized the results of the panelists first round voting. These personalized documents served as the basis for discussions of scenarios which resulted in disagreement.

After all of the disagreed upon scenarios were discussed, the Voting Panel performed a second round of voting for only those scenarios. After the round two ratings were submitted, AAOS staff calculated the median values and level of agreement for all voting items, after which the Voting Panel examined the ratings for anomalies. There was no attempt to obtain consensus among the panel members.

FINAL RATINGS

Using the median value of the second round ratings, AAOS determined the final levels of appropriateness. Disagreement among raters can affect the final rating. Agreement and disagreement were determined using the BIOMED definitions of Agreement and Disagreement as reported in the RAND/UCLA Appropriate Method User's Manual for a panel of 8-10 voting members (see Table 3 below). For this panel size, disagreement is defined as when ≥ 3 member's appropriateness ratings fell within the appropriate (7-9) and rarely appropriate (1-3) ranges for any scenario (i.e. ≥ 3 member's ratings fell between 1-3 and ≥ 3 member's ratings fell between 7-9 on any given scenario and its treatment).If there is still disagreement in the Voting Panel ratings after the second round of voting, that voting item is labeled as "5" regardless of median score. Agreement is defined as ≤ 2 panelists rated outside of the 3-point range containing the median.

Table 3. Defining Agreement and Disagreement for Appropriateness Ratings

	Disagreement	Agreement
Panel Size	Number of panelists rating in each extreme (1-3 and 7-9)	Number of panelists rating outside the 3-point region containing the median (1-3, 4-6, 7-9)
8,9,10	≥ 3	≤ 2
11,12,13	≥ 4	≤ 3
14,15,16	≥ 5	≤ 4

Adapted from RAM [1]

The classifications in the table below determined final levels of appropriateness.

Table 4. Interpreting Final Ratings of Criteria

Level of Appropriateness	Description
Appropriate	• Median panel rating between 7-9 and no disagreement
May Be Appropriate	• Median panel rating between 4-6 or • Median panel rating 1-9 with disagreement
Rarely Appropriate	• Median panel rating between 1-3 and no disagreement

REVISION PLANS

These criteria represent a cross-sectional view of current use of treatments for distal radius fractures and may become outdated as new evidence becomes available or clinical decision making indicators are improved. AAOS will update or withdraw these criteria in five years in accordance with the standards of the National Guideline Clearinghouse. AAOS will issue updates in accordance with new evidence, changing practice, rapidly emerging treatment options, and new technology.

DISSEMINATING APPROPRIATE USE CRITERIA

Publication of the Appropriate Use Criteria (AUC) document is on the AAOS website at [http://www.aaos.org/auc]. This document provides interested readers with full documentation about the development of Appropriate Use Criteria and further details of the criteria ratings.

AUCs are first announced by an Academy press release and then published on the AAOS website. AUC summaries are published in the *AAOS Now* and the Journal of the American Academy of Orthopaedic Surgeons (JAAOS). In addition, the Academy's Annual Meeting showcases the AUCs on Academy Row and at Scientific Exhibits.

The dissemination efforts of AUC include web-based mobile applications, webinars, online modules for the Orthopaedic Knowledge Online website, Radio Media Tours, and Media Briefings. In addition AUCS are also promoted in relevant Continuing Medical Education (CME) courses and distributed at the AAOS Resource Center.

Other dissemination efforts outside of the AAOS include submitting AUCs to the National Guideline Clearinghouse and to other medical specialty societies' meetings.

III. DEFINITIONS AND ASSUMPTIONS

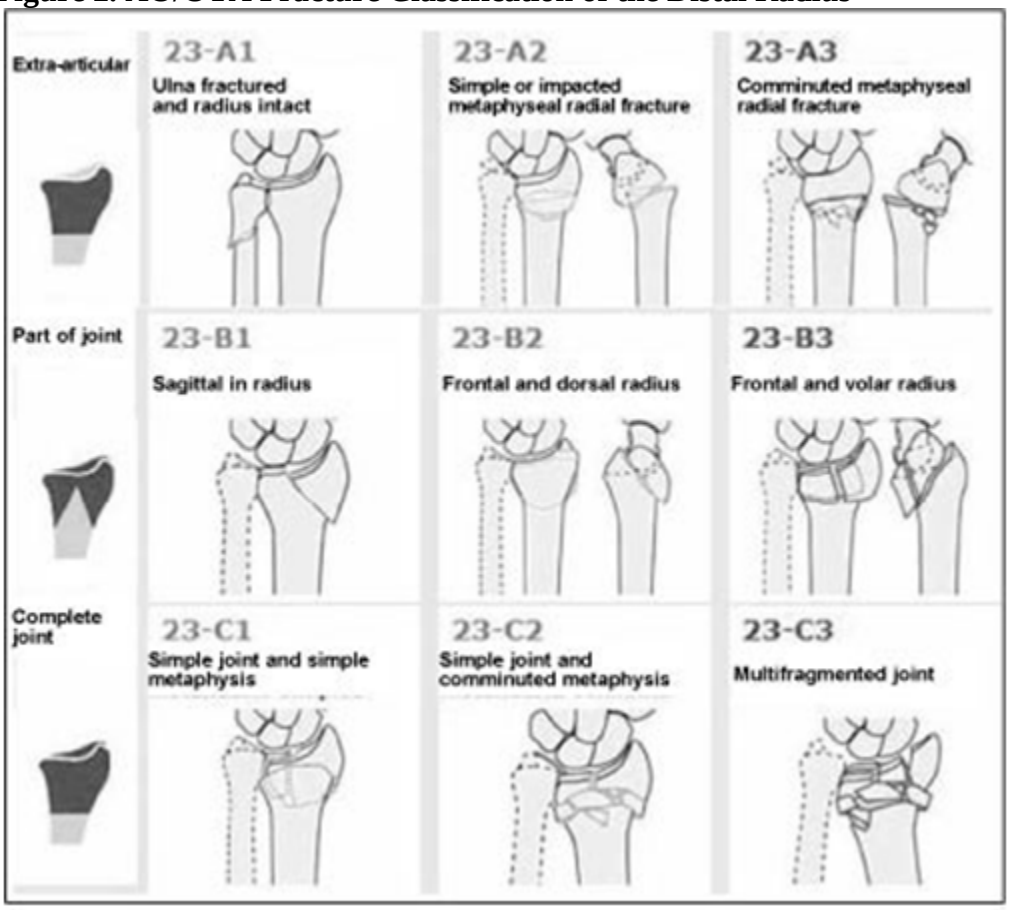
DEFINITIONS

The following definitions standardized the interpretation of the clinical scenarios presented in the Treatment of Distal Radius Fractures Appropriate Use Criteria. This standardization ensures that those responsible for rating the appropriateness of a scenario and those reading these scenarios are using the same parameters to address the scenario.

AO/OTA Fracture Type:

- A: Extra-articular fracture
- B: Partial articular fracture
- C: Complete articular fracture of the radius

Figure 2. AO/OTA Fracture Classification of the Distal Radius[6]



Mechanism of Injury:

- High energy: Injury due to trauma, such as a fall from higher than standing height, motor vehicle accident, or industrial accident where velocity at impact results in high compression forces; assuming significant displacement and comminution.
- Low energy: Injury due to chronic conditions that weaken the strength of the bone and low velocity at impact results in bending forces; assuming minimal comminution and displacement.

Functional Demands:

- Homebound: Effort required for patient to leave their residency is taxing and unsafe. Require human assistance to leave home.
- Independent: Routinely completes activities of daily living with assistance of ambulation devices (canes, walkers, etc).
- Normal: Completes activities of daily living without assistance.
- High: Patients experiencing substantial stress/stain on their wrist on a regular basis (e.g. high-level athletics, heavy labor jobs).

American Society of Anesthesiologist's (ASA) Status (co-morbidities)

- ASA 1: Normal, healthy patient
- ASA 2: Patient with mild systemic disease
- ASA 3: Patient with severe systemic disease
- ASA 4: Patient with severe systemic disease that is a constant threat to life

Associated injuries

- No associated injuries: Isolated distal radius fracture.
- Open fracture: Wound caused by penetration or puncture of the skin (e.g. foreign objects, fractured bones) of the same arm as the distal radius fracture. Open fractures are defined using the following two Gustilo classifications:
    a) Grade I or II open fracture
    b) Grade III open fracture
- Median nerve injury: Damage/dysfunction of the median nerve on the same arm as the distal radius fracture, determined by physical examination or electrodiagnostic testing.
- Other ipsilateral injury: Injuries to ligaments, bones, or soft tissue of the same arm/hand as the distal radius fracture.

GENERAL ASSUMPTIONS

The following assumptions clarified the interpretation of the clinical scenarios presented in the Treatment of Distal Radius Fractures Appropriate Use Criteria. This standardization ensures that those responsible for rating the appropriateness of a scenario and those reading these scenarios are using the same parameters to address the scenario.

Before these AUC are consulted, it is assumed that:

1. The patient is healthy enough to undergo surgery if indicated.
2. An adequate physical exam of the patient has been conducted.
3. Adequate radiographs have been obtained and examined by the clinician.
4. The patient history is available and has been reviewed by the clinician.
5. The patient has given adequate and informed consent.
6. The surgeon is trained and capable of performing all operative techniques with equal effectiveness.
7. The fracture is not so complex, and/or the patient's comorbidities or social situation such a factor, as to represent an exception to these scenarios (e.g. C3.3 fracture that might be optimally treated with a distraction plate).
8. There is not a clear advantage (i.e. evidence for or against) for one procedure based on fracture pattern (e.g. volar plate for volar shearing fracture).
9. The surgery, when indicated, will be performed in a timely fashion to allow ideal treatment of the fracture.
10. The surgeon will perform the surgery in the most appropriate location (i.e., ASC, outpatient, inpatient) based on the health of the patient and other injuries rather the nature of the fracture. Open fractures and associated injuries may dictate that surgery should be inpatient.
11. The surgeon will choose a cost effective treatment based on the nature of the fracture and expectations after surgery.
12. The facility has each type of implant/equipment available and capable support personnel.
13. In the event that the patient has an open wound, it is assumed that the clinician has cleaned the wound before considering treatment.
14. It is assumed that a low-energy open fracture is a Grade I or II open fracture.

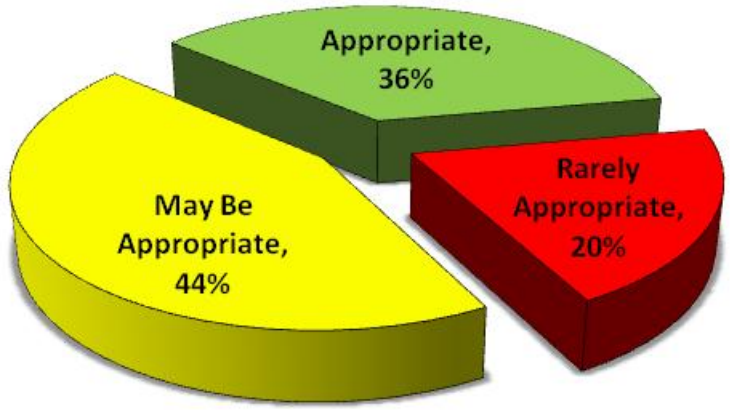
IV. RESULTS OF APPROPRIATENESS RATINGS

The following appropriate use criteria tables contain the final appropriateness ratings assigned by the nine members of the voting panel. The appropriate use criteria tables are formatted by AO fracture type (i.e. A, B, or C) and mechanism of injury (i.e. high mechanism of injury versus low mechanism of injury). Additional patient characteristics are found under the column titled "Patient Characteristics". The appropriate use criteria for each patient scenario can be found under each of the 10 treatment columns. These criteria are formatted by appropriateness labels (i.e. "R"=Rarely Appropriate, "M"=May Be Appropriate, and "A"=Appropriate), median score (in parentheses), and + or - indicating agreement or disagreement, respectively.

Out of 2160 total voting items (i.e. 216 patient scenarios x 10 treatments), 440 (20%) voting items were rated as "Rarely Appropriate", 953 (44%) voting items were rated as "May Be Appropriate", and 767 (36%) voting items were rated as "Appropriate" (Figure 1). Additionally, the voting panel members were in agreement on 730 (34%) voting items and were in disagreement on 10 (0.5%) voting items.

The appropriate use criteria can also be accessed online via our AUC web-based application at www.aaos.org/aucapp.

Figure 1.
Summary of Appropriateness Ratings



AO/OTA A Fracture Type; High Energy Mechanism of Injury

SCENARIO #	PATIENT CHARACTERISTICS	TREATMENTS									
		Immobilization without reduction	*Reduction and Immobilization*	*Percutaneous Pinning*	*Spanning External Fixation*	*Non-Spanning External Fixation*	*Distraction Plate*	*Volar locking Plate*	*Dorsal Plate*	*Fragment Specific Fixation*	*Intramedullary Nail*
1	Home-bound, ASA 1-2-3, No associated injuries	R (2)+	A (7)+	M (6)	A (7)+	R (3)	R (3)	A (7)	A (7)+	M (6)	A (7)
2	Home-bound, ASA 1-2-3, Grade I or II Open Fracture	R (2)+	M (5)	A (7)	A (7)+	M (6)	M (5)	A (7)+	A (7)	M (6)	M (6)
3	Home-bound, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (3)+	A (7)	A (7)+	A (7)	M (5)+	A (7)	M (6)	M (6)	M (6)
4	Home-bound, ASA 1-2-3, Median nerve injury	R (1)+	A (7)	A (7)	A (7)	M (6)	M (5)	A (7)+	M (5)	A (7)	M (6)
5	Home-bound, ASA 1-2-3, Other Ipsilateral Injury	R (2)+	A (7)	M (6)	A (7)	M (6)	M (5)	A (7)	M (6)	A (7)	M (6)
6	Home-bound, ASA 4, No associated injuries	R (2)+	A (7)+	A (7)	A (7)	M (5)+	M (4)	M (6)	M (5)	M (5)	M (5)
7	Home-bound, ASA 4, Grade I or II Open Fracture	R (2)+	M (6)	A (7)	A (7)	M (6)	M (5)+	A (7)+	A (7)	M (6)	M (6)
8	Home-bound, ASA 4, Grade III Open Fracture	R (1)+	M (4)+	A (7)	A (7)+	A (7)	M (5)+	M (6)	M (6)	M (6)+	M (5)
9	Home-bound, ASA 4, Median nerve injury	R (3)	A (7)+	A (7)	A (7)	M (6)	M (5)	M (6)	M (4)	M (6)	M (6)
10	Home-bound, ASA 4, Other Ipsilateral Injury	R (3)	A (7)+	A (7)+	A (7)	M (5)	M (5)	A (7)	M (5)	M (6)	M (5)
11	Functionally Independent, ASA 1-2-3, No associated injuries	R (2)+	A (7)	M (6)	A (7)	R (3)	M (5)	A (7)	A (7)	A (7)	M (6)
12	Functionally Independent, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)	A (7)+	M (5)	A (7)+	A (7)+	A (7)	M (6)
13	Functionally Independent, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (3)+	A (7)	A (7)	A (7)	M (5)+	A (7)+	A (7)	M (6)	M (5)
14	Functionally Independent, ASA 1-2-3, Median nerve injury	R (1)	R (3)	A (7)	M (6)	M (5)	M (5)	A (8)	M (6)	A (7)	A (7)
15	Functionally Independent, ASA 1-2-3, Other Ipsilateral Injury	R (2)+	A (7)	A (7)	M (6)	M (5)	M (5)	A (8)+	A (7)	A (7)	A (7)+
16	Functionally Independent, ASA 4, No associated injuries	R (1)+	A (7)+	A (7)	A (7)	M (5)	M (5)	A (7)	M (6)	M (5)	M (6)
17	Functionally Independent, ASA 4, Grade I or II Open Fracture	R (1)+	M (4)+	A (7)+	A (7)+	A (7)	M (5)+	A (7)	A (7)	M (6)	M (6)
18	Functionally Independent, ASA 4, Grade III Open Fracture	R (1)+	M (4)+	A (7)	A (7)+	M (6)	M (5)+	M (6)	M (6)	M (6)	M (6)
19	Functionally Independent, ASA 4, Median nerve injury	R (3)+	A (7)+	A (7)	A (7)	M (6)	M (5)	A (7)+	M (6)	M (6)+	M (6)
20	Functionally Independent, ASA 4, Other Ipsilateral Injury	R (2)	A (7)	A (7)+	A (7)	M (6)	M (6)+	A (7)	M (6)	M (6)	M (6)
21	Normal Functioning, ASA 1-2-3, No associated injuries	R (2)+	A (7)+	A (7)	A (7)	M (6)	M (6)	A (8)+	A (7)	A (7)+	A (7)
22	Normal Functioning, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (1)+	A (7)	A (7)+	A (7)	M (5)+	A (7)+	A (7)+	A (7)	A (7)
23	Normal Functioning, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (3)+	A (7)+	A (7)+	A (7)	M (5)+	A (7)	A (7)	M (6)	M (5)
24	Normal Functioning, ASA 1-2-3, Median nerve injury	R (1)+	M (5)	A (7)+	A (7)	M (6)	M (5)	A (8)+	M (6)	A (7)+	A (7)
25	Normal Functioning, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	A (7)	A (7)	A (7)	M (6)	M (5)	A (8)+	M (6)	A (7)+	M (6)
26	Normal Functioning, ASA 4, No associated injuries	R (3)	A (7)+	A (7)+	M (6)	M (6)	M (5)	A (7)	M (6)	M (6)+	A (7)
27	Normal Functioning, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)+	M (6)	M (5)+	M (6)	M (6)	M (6)+	M (6)
28	Normal Functioning, ASA 4, Grade III Open Fracture	R (1)+	M (4)+	A (7)	A (7)+	A (7)	M (5)+	M (6)	M (6)	M (6)+	M (5)
29	Normal Functioning, ASA 4, Median nerve injury	R (1)+	A (7)+	A (7)+	A (7)	M (6)	M (5)	A (8)	M (5)	M (6)	M (5)
30	Normal Functioning, ASA 4, Other Ipsilateral Injury	R (1)	A (7)+	A (7)+	A (7)	M (6)	M (5)	A (7)	M (6)	M (6)	M (6)
31	High Functional Demands, ASA 1-2-3, No associated injuries	R (2)+	A (7)+	M (6)	M (6)	A (7)	M (4)	A (8)+	M (6)	A (7)	A (7)+
32	High Functional Demands, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (2)+	A (7)	A (7)+	A (7)	M (5)+	A (7)+	A (7)+	M (6)	M (6)
33	High Functional Demands, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (1)+	A (7)	A (7)+	A (7)	M (6)+	A (7)	A (7)	M (6)	M (6)
34	High Functional Demands, ASA 1-2-3, Median nerve injury	R (1)+	A (7)	A (7)	M (6)	M (6)	M (5)	A (8)+	M (6)	A (7)	M (6)
35	High Functional Demands, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	A (7)	A (7)	M (6)	M (6)	M (6)	A (8)+	M (6)	A (7)	A (7)
36	High Functional Demands, ASA 4, No associated injuries	R (1)+	A (7)+	A (7)+	A (7)	M (6)	M (5)	A (7)	M (6)	M (6)	M (5)
37	High Functional Demands, ASA 4, Grade I or II Open Fracture	R (1)+	R (2)+	A (7)	A (7)+	A (7)	M (5)+	A (7)	A (7)	M (6)+	M (6)
38	High Functional Demands, ASA 4, Grade III Open Fracture	R (1)+	R (2)+	A (7)	A (7)+	A (7)	M (5)+	M (6)	M (6)	M (6)+	M (6)
39	High Functional Demands, ASA 4, Median nerve injury	R (1)+	A (7)+	A (7)+	A (7)	M (6)	M (4)	A (8)	M (6)	M (6)	M (6)
40	High Functional Demands, ASA 4, Other Ipsilateral Injury	R (1)	A (7)+	A (7)+	A (7)	M (6)	M (5)	A (8)	M (6)	M (6)	M (6)

* R=Rarely Appropriate, M=May be Appropriate, A=Appropriate; Numbers in parentheses indicate median rating of voting panel; "+" =Agreement between voting panel members, "-" = Disagreement between voting panel members

AO/OTA A Fracture Type; Low Energy Mechanism of Injury

SCENARIO #	PATIENT CHARACTERISTICS	TREATMENTS									
		Immobilization without reduction	*Reduction and Immobilization*	*Percutaneous Pinning*	*Spanning External Fixation*	*Non-Spanning External Fixation*	*Distraction Plate*	*Volar locking Plate*	*Dorsal Plate*	*Fragment Specific Fixation*	*Intramedullary Nail*
41	Home-bound, ASA 1-2-3, No associated injuries	M (5)	A (8)+	A (7)+	M (5)	M (4)	R (3)+	A (7)+	M (5)	M (6)	A (7)
42	Home-bound, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)+	A (7)	M (5)+	A (7)+	A (7)+	M (6)	A (7)
43	Home-bound, ASA 1-2-3, Median nerve injury	R (3)+	A (7)+	A (7)	M (6)	M (5)	R (3)	A (7)+	M (5)	M (6)	M (5)
44	Home-bound, ASA 1-2-3, Other Ipsilateral Injury	R (3)	A (7)+	A (7)+	M (6)	M (5)+	M (4)	A (7)+	M (6)	M (6)	M (5)
45	Home-bound, ASA 4, No associated injuries	A (7)	A (8)+	M (6)	M (4)	R (3)+	R (3)+	M (6)	M (6)	M (6)	M (5)
46	Home-bound, ASA 4, Grade I or II Open Fracture	R (1)+	M (4)+	A (7)	A (7)	M (6)	M (5)+	M (6)	M (6)	M (6)	M (6)
47	Home-bound, ASA 4, Median nerve injury	M (5)	A (7)+	A (7)	M (5)	R (3)	R (3)+	M (5)	M (5)+	M (5)	M (5)
48	Home-bound, ASA 4, Other Ipsilateral Injury	R (3)	A (7)+	A (7)	M (6)	R (3)	R (3)+	M (6)	M (5)	M (5)	M (5)
49	Functionally Independent, ASA 1-2-3, No associated injuries	R (2)+	A (7)+	A (7)+	M (6)	M (4)	R (3)	A (7)+	M (6)	M (6)	A (7)
50	Functionally Independent, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)+	A (7)	M (5)	A (7)+	A (7)+	M (6)	A (7)
51	Functionally Independent, ASA 1-2-3, Median nerve injury	R (3)+	A (7)+	A (7)+	M (6)	M (5)	R (3)	A (7)+	M (5)	M (6)	A (7)
52	Functionally Independent, ASA 1-2-3, Other Ipsilateral Injury	R (3)+	A (7)+	A (7)+	M (6)	M (5)	R (3)	A (8)+	M (6)	M (6)	A (7)
53	Functionally Independent, ASA 4, No associated injuries	R (2)	A (7)+	A (7)+	M (6)	M (4)	R (3)+	A (7)	M (6)+	M (5)+	M (6)
54	Functionally Independent, ASA 4, Grade I or II Open Fracture	R (1)+	M (4)+	A (7)	A (7)	M (6)	M (5)+	M (6)	M (6)	M (6)+	M (5)
55	Functionally Independent, ASA 4, Median nerve injury	R (1)+	A (7)+	A (7)	M (6)	M (5)	R (3)	A (7)	M (5)	M (6)	M (5)
56	Functionally Independent, ASA 4, Other Ipsilateral Injury	R (3)	A (7)+	A (7)	M (6)	M (5)	R (3)	A (7)	M (5)	M (6)	M (6)
57	Normal Functioning, ASA 1-2-3, No associated injuries	R (1)+	A (8)+	A (7)+	M (6)	M (6)	R (3)	A (7)+	M (6)	A (7)	A (7)
58	Normal Functioning, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)+	A (7)	M (5)	A (7)+	A (7)+	M (6)	A (7)
59	Normal Functioning, ASA 1-2-3, Median nerve injury	R (1)	A (7)+	A (7)+	M (6)	M (6)	M (4)	A (8)+	M (6)	A (7)	A (7)
60	Normal Functioning, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	A (7)+	A (7)+	M (6)	M (6)	M (4)	A (8)+	M (6)	A (7)	A (7)
61	Normal Functioning, ASA 4, No associated injuries	R (3)+	A (7)+	A (7)+	M (6)+	M (5)+	R (3)	A (7)	M (6)	M (6)	M (6)
62	Normal Functioning, ASA 4, Grade I or II Open Fracture	R (1)+	M (4)+	A (7)	A (7)	M (6)	M (5)+	A (7)	A (7)	M (6)+	M (6)
63	Normal Functioning, ASA 4, Median nerve injury	R (1)+	A (7)+	A (7)+	M (6)	M (5)	M (4)	A (8)	M (5)	M (6)	M (6)
64	Normal Functioning, ASA 4, Other Ipsilateral Injury	R (2)	A (7)+	A (7)+	M (6)	M (6)	M (4)	A (7)	M (6)	M (6)	M (6)
65	High Functional Demands, ASA 1-2-3, No associated injuries	R (1)+	A (7)+	A (7)+	A (7)	M (6)	R (3)	A (8)+	M (6)	A (7)	A (7)
66	High Functional Demands, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)	A (7)	M (5)	A (7)+	A (7)+	M (6)	A (7)
67	High Functional Demands, ASA 1-2-3, Median nerve injury	R (1)+	A (7)+	A (7)+	M (5)	M (5)	M (5)	A (8)+	M (6)	A (7)	A (7)
68	High Functional Demands, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	A (7)+	A (7)+	M (6)	M (6)	M (4)	A (8)+	M (6)	M (6)	A (7)
69	High Functional Demands, ASA 4, No associated injuries	R (3)	A (7)+	A (7)+	A (7)	M (6)	R (3)+	A (7)	M (5)	M (5)	M (6)
70	High Functional Demands, ASA 4, Grade I or II Open Fracture	R (1)+	M (4)+	A (7)	A (7)	M (6)	M (5)+	A (7)	A (7)	M (6)+	M (6)
71	High Functional Demands, ASA 4, Median nerve injury	R (1)+	A (7)+	A (7)+	M (5)	M (5)	R (3)	A (7)	M (5)	M (5)	M (6)
72	High Functional Demands, ASA 4, Other Ipsilateral Injury	R (1)	A (7)+	A (7)+	M (5)	M (5)	M (4)	A (7)	M (6)	M (6)	M (6)

* R=Rarely Appropriate, M=May be Appropriate, A=Appropriate; Numbers in parentheses indicate median rating of voting panel; "+" =Agreement between voting panel members, "-" = Disagreement between voting panel members

AO/OTA B Fracture Type; High Energy Mechanism of Injury

SCENARIO #	PATIENT CHARACTERISTICS	TREATMENTS									
		Immobilization without reduction	*Reduction and Immobilization*	*Percutaneous Pinning*	*Spanning External Fixation*	*Non-Spanning External Fixation*	*Distraction Plate*	*Volar locking Plate*	*Dorsal Plate*	*Fragment Specific Fixation*	*Intramedullary Nail*
73	Home-bound, ASA 1-2-3, No associated injuries	R (1)+	M (4)	A (7)	M (6)	M (5)+	M (5)	A (9)+	M (6)	A (8)	M (4)
74	Home-bound, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (2)+	A (7)	M (6)	M (5)+	M (5)	A (8)+	A (7)+	A (7)	M (4)+
75	Home-bound, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (3)+	M (4)	A (7)	M (5)	M (5)	A (7)	A (7)	A (7)	M (5)+
76	Home-bound, ASA 1-2-3, Median nerve injury	R (1)	M (6)	A (7)	M (6)	M (5)	M (5)	A (7)	M (6)	A (7)	M (5)
77	Home-bound, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	M (5)-	A (7)	M (6)	M (5)	M (5)+	A (8)+	M (6)	A (8)+	M (5)
78	Home-bound, ASA 4, No associated injuries	R (3)	A (7)+	M (6)	M (6)	M (5)	M (5)+	A (8)	M (6)	M (6)	M (5)
79	Home-bound, ASA 4, Grade I or II Open Fracture	R (1)+	M (4)+	M (6)+	M (6)	M (5)+	M (5)+	M (6)	M (6)	M (6)	M (5)+
80	Home-bound, ASA 4, Grade III Open Fracture	R (1)+	R (3)+	M (5)-	A (7)	M (5)	M (5)	M (6)	M (6)	M (6)	M (4)+
81	Home-bound, ASA 4, Median nerve injury	R (2)+	A (7)	M (6)	M (6)	M (5)	M (5)	A (8)	M (5)	A (8)	M (4)
82	Home-bound, ASA 4, Other Ipsilateral Injury	R (3)	A (7)	M (6)	M (6)	M (5)	M (5)	A (8)	M (6)	A (7)	M (5)
83	Functionally Independent, ASA 1-2-3, No associated injuries	R (1)+	R (2)	A (7)	M (6)	M (5)	M (5)+	A (8)+	M (6)	A (8)	M (5)
84	Functionally Independent, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)	M (5)	M (6)	A (7)+	A (7)+	A (7)+	M (5)+
85	Functionally Independent, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (3)	M (6)	A (7)	M (5)	M (6)+	A (7)	M (6)	A (7)	M (5)+
86	Functionally Independent, ASA 1-2-3, Median nerve injury	R (1)	R (2)	A (7)	M (6)	M (5)	M (4)	A (9)+	M (6)	A (8)+	M (5)
87	Functionally Independent, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	R (2)	M (6)	M (6)	M (5)	M (5)	A (8)+	A (7)+	A (8)+	M (5)
88	Functionally Independent, ASA 4, No associated injuries	M (4)	A (7)	M (6)	M (6)	M (5)	R (2)	A (7)	M (6)	A (7)	M (5)
89	Functionally Independent, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	M (6)	M (5)	M (5)	A (7)+	A (7)+	A (7)+	M (5)+
90	Functionally Independent, ASA 4, Grade III Open Fracture	R (1)+	R (3)+	M (6)	A (7)	M (5)	M (6)	M (6)	M (6)	M (6)	M (5)+
91	Functionally Independent, ASA 4, Median nerve injury	R (1)+	M (5)	A (7)	M (6)	M (5)	M (4)	A (8)	M (6)	A (8)	M (5)
92	Functionally Independent, ASA 4, Other Ipsilateral Injury	R (3)	R (3)	M (6)	M (6)	M (5)	M (5)	A (8)	M (6)	A (8)	M (5)
93	Normal Functioning, ASA 1-2-3, No associated injuries	R (1)+	R (3)	A (7)	M (6)	M (5)	M (4)	A (9)+	A (7)+	A (9)+	M (5)
94	Normal Functioning, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	M (6)	M (5)	M (5)+	A (8)+	A (7)+	A (7)+	M (5)+
95	Normal Functioning, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (3)+	A (7)	A (7)	M (5)	M (5)	A (7)	A (7)	A (7)	M (5)+
96	Normal Functioning, ASA 1-2-3, Median nerve injury	R (1)+	R (3)	A (7)	M (6)	M (4)	M (4)	A (9)+	A (7)	A (8)+	M (5)
97	Normal Functioning, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	R (3)	A (7)	M (6)	M (5)	M (4)	A (8)+	A (7)	A (8)+	M (5)
98	Normal Functioning, ASA 4, No associated injuries	R (3)	M (5)	M (6)	M (6)	M (5)	M (5)	A (8)	M (6)	A (8)	M (5)
99	Normal Functioning, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	M (6)+	M (5)+	M (5)+	A (7)	A (7)	A (7)	M (5)+
100	Normal Functioning, ASA 4, Grade III Open Fracture	R (1)+	R (3)	M (6)	A (7)	M (5)	M (5)	A (7)	A (7)	A (7)	M (5)
101	Normal Functioning, ASA 4, Median nerve injury	R (2)+	R (3)	M (6)	M (6)	M (5)	M (4)	A (8)	M (5)	A (8)	M (5)
102	Normal Functioning, ASA 4, Other Ipsilateral Injury	R (2)	M (5)	A (7)	M (6)	M (5)	M (5)	A (8)	M (6)	A (8)	M (5)
103	High Functional Demands, ASA 1-2-3, No associated injuries	R (1)+	R (3)	M (6)	M (5)	M (4)	R (3)	A (9)+	A (7)+	A (8)+	M (5)
104	High Functional Demands, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	A (7)	M (4)+	M (5)	A (7)+	A (7)+	A (7)+	M (5)+
105	High Functional Demands, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (3)+	M (6)	A (7)	M (5)+	M (5)+	A (7)	A (7)	A (7)	M (5)+
106	High Functional Demands, ASA 1-2-3, Median nerve injury	R (1)+	R (3)	M (6)	M (6)	M (5)	R (3)	A (9)+	A (7)	A (8)	R (3)+
107	High Functional Demands, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	R (3)	M (6)	M (6)	M (5)	M (5)	A (9)+	A (8)+	A (8)+	R (3)
108	High Functional Demands, ASA 4, No associated injuries	R (3)+	M (5)-	M (6)	M (6)	M (5)	R (3)	A (7)	M (6)	A (7)	M (4)+
109	High Functional Demands, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	A (7)	M (5)+	M (5)+	A (7)	A (7)	M (6)	M (5)
110	High Functional Demands, ASA 4, Grade III Open Fracture	R (1)+	R (3)+	M (6)	A (7)	M (5)	M (5)+	A (7)	M (6)	A (7)	M (5)+
111	High Functional Demands, ASA 4, Median nerve injury	R (2)+	M (5)-	M (6)	M (5)	M (4)	R (3)	A (8)	M (6)	A (7)	M (4)
112	High Functional Demands, ASA 4, Other Ipsilateral Injury	R (2)+	M (5)	M (6)	M (5)	M (4)	M (4)	A (8)	M (6)	A (8)	M (4)

* R=Rarely Appropriate, M=May be Appropriate, A=Appropriate; Numbers in parentheses indicate median rating of voting panel; "+" =Agreement between voting panel members, "-" = Disagreement between voting panel members

AO/OTA B Fracture Type; Low Energy Mechanism of Injury

SCENARIO #	PATIENT CHARACTERISTICS	TREATMENTS									
		Immobilization without reduction	*Reduction and Immobilization*	*Percutaneous Pinning*	*Spanning External Fixation*	*Non-Spanning External Fixation*	*Distraction Plate*	*Volar locking Plate*	*Dorsal Plate*	*Fragment Specific Fixation*	*Intramedullary Nail*
113	Home-bound, ASA 1-2-3, No associated injuries	R (3)	A (7)+	A (7)	M (5)	M (4)	R (3)	A (7)+	A (7)	A (7)	M (4)
114	Home-bound, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	M (6)	M (5)	M (5)+	A (7)+	A (7)+	A (7)+	M (4)+
115	Home-bound, ASA 1-2-3, Median nerve injury	R (2)	M (5)-	A (7)	M (5)	M (5)	R (3)	A (7)	M (6)	A (7)	M (5)
116	Home-bound, ASA 1-2-3, Other Ipsilateral Injury	R (3)	A (7)	A (7)	M (5)	M (4)	R (3)	A (7)+	A (7)	A (7)	M (5)
117	Home-bound, ASA 4, No associated injuries	M (5)	A (7)+	M (6)	M (5)+	M (4)	R (3)+	A (7)	M (6)+	A (7)	M (5)
118	Home-bound, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	M (6)	M (5)	M (5)+	A (7)	A (7)	A (7)	M (5)+
119	Home-bound, ASA 4, Median nerve injury	R (3)	M (5)	M (6)	M (5)+	R (3)	R (3)	A (7)	M (5)+	A (7)	M (5)
120	Home-bound, ASA 4, Other Ipsilateral Injury	R (3)	A (7)+	M (6)	M (5)	M (4)	R (3)+	A (7)	M (6)+	A (7)	M (4)
121	Functionally Independent, ASA 1-2-3, No associated injuries	R (2)+	M (5)-	A (7)	M (5)+	M (4)	R (3)+	A (8)+	M (6)	A (8)+	M (5)
122	Functionally Independent, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (2)+	A (7)+	M (6)	M (5)+	M (5)+	A (7)+	A (7)+	A (7)	M (5)+
123	Functionally Independent, ASA 1-2-3, Median nerve injury	R (2)+	M (5)	A (7)	M (5)	M (4)	R (3)+	A (8)+	M (5)	A (7)+	M (5)
124	Functionally Independent, ASA 1-2-3, Other Ipsilateral Injury	R (3)+	M (5)	A (7)	M (5)	M (4)	R (3)+	A (8)+	M (6)	A (8)+	M (5)
125	Functionally Independent, ASA 4, No associated injuries	M (4)	A (7)	A (7)	M (5)	M (5)	R (3)+	A (8)+	M (6)	A (8)	M (5)
126	Functionally Independent, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	M (6)	M (5)	M (5)+	A (7)	A (7)	A (7)	M (5)+
127	Functionally Independent, ASA 4, Median nerve injury	R (2)	M (5)-	A (7)	M (5)	M (4)	R (3)+	A (8)+	M (6)	A (7)	M (5)
128	Functionally Independent, ASA 4, Other Ipsilateral Injury	R (2)	A (7)	A (7)	M (5)	M (4)	R (3)+	A (8)+	M (6)	A (8)	M (4)
129	Normal Functioning, ASA 1-2-3, No associated injuries	R (2)+	M (6)	A (7)+	M (5)	M (4)	R (3)	A (8)+	M (6)	A (8)+	M (5)
130	Normal Functioning, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (2)+	A (7)	M (6)	M (5)+	M (5)+	A (8)+	A (7)+	A (7)+	M (5)+
131	Normal Functioning, ASA 1-2-3, Median nerve injury	R (2)	M (5)	A (7)	M (5)	R (3)	R (3)+	A (8)+	M (6)	A (7)+	M (5)
132	Normal Functioning, ASA 1-2-3, Other Ipsilateral Injury	R (2)+	M (4)	A (7)	M (5)	R (2)	R (3)	A (8)+	M (6)	A (8)+	M (5)
133	Normal Functioning, ASA 4, No associated injuries	R (3)	A (7)	A (7)	M (5)	M (4)	R (3)	A (7)+	M (6)	A (7)+	M (4)
134	Normal Functioning, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	M (6)	M (5)	M (5)+	A (7)	A (7)	A (7)	M (5)
135	Normal Functioning, ASA 4, Median nerve injury	R (2)	M (5)-	A (7)	M (5)	M (4)	R (3)	A (7)	M (6)	A (7)+	M (4)
136	Normal Functioning, ASA 4, Other Ipsilateral Injury	M (4)	M (6)	A (7)	M (5)	M (4)	R (3)+	A (8)+	M (6)	A (8)	M (5)
137	High Functional Demands, ASA 1-2-3, No associated injuries	R (1)+	M (4)	M (6)	M (5)	M (5)	R (3)	A (9)+	M (6)	A (8)+	M (5)
138	High Functional Demands, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (2)+	M (6)	M (6)	M (5)+	M (5)+	A (7)+	A (7)+	A (7)+	M (5)+
139	High Functional Demands, ASA 1-2-3, Median nerve injury	R (1)+	R (3)	M (6)	M (5)	M (4)	R (3)+	A (8)+	M (6)	A (8)+	M (5)
140	High Functional Demands, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	R (3)	M (6)	M (5)	M (4)	R (3)	A (8)+	M (6)	A (8)+	M (5)
141	High Functional Demands, ASA 4, No associated injuries	R (1)+	M (4)	A (7)	M (5)	M (4)	R (2)+	A (7)+	M (6)	A (7)	M (4)
142	High Functional Demands, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	A (7)	M (5)	M (5)+	A (7)	A (7)	A (7)	M (5)+
143	High Functional Demands, ASA 4, Median nerve injury	R (1)+	M (5)	A (7)	M (5)	M (4)	R (3)+	A (7)+	M (6)	A (7)	M (5)
144	High Functional Demands, ASA 4, Other Ipsilateral Injury	R (1)+	M (5)-	A (7)	M (5)	M (4)	R (3)+	A (7)+	M (6)	A (7)	M (5)

* R=Rarely Appropriate, M=May be Appropriate, A=Appropriate; Numbers in parentheses indicate median rating of voting panel; "+" =Agreement between voting panel members, "-" = Disagreement between voting panel members

AO/OTA C Fracture Type; High Energy Mechanism of Injury

SCENARIO #	PATIENT CHARACTERISTICS	TREATMENTS									
		Immobilization without reduction	*Reduction and Immobilization*	*Percutaneous Pinning*	*Spanning External Fixation*	*Non-Spanning External Fixation*	*Distraction Plate*	*Volar locking Plate*	*Dorsal Plate*	*Fragment Specific Fixation*	*Intramedullary Nail*
145	Home-bound, ASA 1-2-3, No associated injuries	R (2)+	A (7)	M (6)	A (7)	M (5)	M (6)	A (8)+	M (6)	A (8)+	R (2)
146	Home-bound, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	A (7)+	M (5)+	A (7)	A (7)+	A (7)+	A (7)+	M (5)+
147	Home-bound, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (2)+	M (6)	A (7)+	M (5)+	M (6)	A (7)	A (7)	A (7)	M (5)+
148	Home-bound, ASA 1-2-3, Median nerve injury	R (2)+	A (7)	M (6)	A (7)	M (5)	M (6)+	A (8)+	M (6)	A (8)+	R (3)
149	Home-bound, ASA 1-2-3, Other Ipsilateral Injury	R (2)	A (7)	M (6)	M (6)	M (5)	M (6)	A (8)+	A (7)	A (8)+	R (3)
150	Home-bound, ASA 4, No associated injuries	M (4)	A (7)	M (6)	A (7)	M (4)	M (5)	A (7)	M (5)	A (7)	R (2)
151	Home-bound, ASA 4, Grade I or II Open Fracture	R (1)+	M (4)+	M (6)	A (7)+	M (5)+	M (5)+	A (7)	A (7)	M (6)	M (5)
152	Home-bound, ASA 4, Grade III Open Fracture	R (1)+	M (4)+	M (6)	A (7)+	M (5)+	M (5)	A (7)	A (7)	A (7)	M (5)+
153	Home-bound, ASA 4, Median nerve injury	R (2)+	A (7)	M (6)	A (7)	R (3)	M (5)	A (7)	M (5)	A (7)	R (3)
154	Home-bound, ASA 4, Other Ipsilateral Injury	R (3)	A (7)	M (6)	A (7)	R (3)	M (6)	M (6)	M (6)	M (6)	R (3)
155	Functionally Independent, ASA 1-2-3, No associated injuries	R (2)+	R (2)	M (6)	A (7)+	M (5)+	M (6)	A (8)+	M (6)	A (8)+	R (2)
156	Functionally Independent, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (2)+	M (6)	A (7)	M (5)+	A (7)	A (7)+	A (7)+	A (7)+	M (5)+
157	Functionally Independent, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (2)+	M (5)	A (7)+	M (5)+	M (5)	A (7)	A (7)	A (7)	M (4)
158	Functionally Independent, ASA 1-2-3, Median nerve injury	R (1)+	R (3)	M (6)	A (7)+	M (5)	M (6)	A (8)+	M (6)	A (8)+	R (2)
159	Functionally Independent, ASA 1-2-3, Other Ipsilateral Injury	R (1)	R (2)+	M (6)	A (7)+	R (3)	M (6)	A (8)+	M (6)	A (8)+	R (3)
160	Functionally Independent, ASA 4, No associated injuries	R (2)	A (7)	M (6)	A (7)	M (4)	M (5)	A (7)	M (6)	A (7)	R (2)
161	Functionally Independent, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	A (7)	M (5)+	M (5)+	A (7)	A (7)	M (6)	M (5)
162	Functionally Independent, ASA 4, Grade III Open Fracture	R (1)+	R (2)+	M (6)	A (7)+	M (5)+	M (6)+	M (6)	M (6)	M (6)	M (5)+
163	Functionally Independent, ASA 4, Median nerve injury	R (1)+	A (7)	M (6)	A (7)	R (3)	M (5)	A (8)	M (5)	A (8)	R (3)
164	Functionally Independent, ASA 4, Other Ipsilateral Injury	R (1)	A (7)	M (6)	A (7)+	R (3)	M (5)	A (8)	M (6)	A (8)	R (3)
165	Normal Functioning, ASA 1-2-3, No associated injuries	R (1)+	R (3)	M (6)	A (7)	R (3)	M (6)	A (9)+	A (7)	A (9)+	R (2)
166	Normal Functioning, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (2)+	M (6)	A (7)+	M (5)+	M (5)	A (7)+	A (7)+	A (7)+	M (4)+
167	Normal Functioning, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (2)+	A (7)	A (7)+	M (5)	M (6)	A (7)	A (7)	A (7)	M (4)+
168	Normal Functioning, ASA 1-2-3, Median nerve injury	R (1)+	M (4)	M (6)	A (7)	R (3)	M (6)	A (9)+	M (6)	A (8)+	R (2)
169	Normal Functioning, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	R (3)	M (6)	A (7)+	R (3)	M (6)	A (8)+	M (6)	A (8)	R (2)
170	Normal Functioning, ASA 4, No associated injuries	R (2)+	M (6)	M (6)	A (7)+	M (5)	M (6)	A (8)+	M (6)	A (8)	R (2)
171	Normal Functioning, ASA 4, Grade I or II Open Fracture	R (1)+	M (4)+	A (7)	A (7)	M (5)+	M (5)+	A (7)	M (6)	M (6)	M (4)+
172	Normal Functioning, ASA 4, Grade III Open Fracture	R (1)+	R (3)+	M (6)	A (7)+	M (5)	M (5)	M (6)	M (6)	M (6)	M (4)+
173	Normal Functioning, ASA 4, Median nerve injury	R (1)+	M (5)	M (6)	A (7)	R (3)	M (5)	A (8)+	M (5)	A (8)	R (2)
174	Normal Functioning, ASA 4, Other Ipsilateral Injury	R (2)+	M (6)	M (6)	A (7)	M (5)	M (5)	A (8)+	M (6)	A (8)	R (2)
175	High Functional Demands, ASA 1-2-3, No associated injuries	R (1)+	R (3)	M (6)	M (6)	R (3)	M (6)	A (9)+	M (6)	A (9)+	R (2)
176	High Functional Demands, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (1)	M (6)+	A (7)+	M (5)	A (7)+	A (7)	A (7)+	A (7)+	M (4)+
177	High Functional Demands, ASA 1-2-3, Grade III Open Fracture	R (1)+	R (2)	M (6)+	A (7)	M (5)	M (6)	A (7)	A (7)	A (7)	M (4)+
178	High Functional Demands, ASA 1-2-3, Median nerve injury	R (1)+	M (5)	M (6)	A (7)	R (3)	M (6)	A (8)+	M (6)	A (8)+	R (2)
179	High Functional Demands, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	R (3)	M (6)	A (7)+	M (5)	M (6)	A (8)+	M (6)	A (8)	R (2)
180	High Functional Demands, ASA 4, No associated injuries	R (2)+	A (7)	M (6)	A (7)	R (3)	M (5)	A (7)	M (6)	A (8)	R (2)
181	High Functional Demands, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	A (7)	M (5)+	M (5)+	A (7)	M (6)	M (6)	M (4)+
182	High Functional Demands, ASA 4, Grade III Open Fracture	R (1)	R (3)	M (6)	A (7)	M (5)	M (6)	M (6)	M (6)	M (6)	M (4)
183	High Functional Demands, ASA 4, Median nerve injury	R (1)+	R (3)	M (6)	A (7)	R (2)	M (5)	A (8)+	M (5)	A (8)	R (2)
184	High Functional Demands, ASA 4, Other Ipsilateral Injury	R (1)+	A (7)	M (6)	A (7)+	R (2)	M (5)	A (8)	M (6)	A (8)	R (2)

* R=Rarely Appropriate, M=May be Appropriate, A=Appropriate; Numbers in parentheses indicate median rating of voting panel; "+" =Agreement between voting panel members, "-" = Disagreement between voting panel members

AO/OTA C Fracture Type; Low Energy Mechanism of Injury

SCENARIO #	PATIENT CHARACTERISTICS	TREATMENTS									
		Immobilization without reduction	*Reduction and Immobilization*	*Percutaneous Pinning*	*Spanning External Fixation*	*Non-Spanning External Fixation*	*Distraction Plate*	*Volar locking Plate*	*Dorsal Plate*	*Fragment Specific Fixation*	*Intramedullary Nail*
185	Home-bound, ASA 1-2-3, No associated injuries	R (3)	A (7)+	M (6)	M (6)	M (4)	M (5)	A (7)+	M (6)+	A (7)	R (2)
186	Home-bound, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)+	M (5)+	A (7)	A (7)+	A (7)	A (7)	R (3)+
187	Home-bound, ASA 1-2-3, Median nerve injury	R (3)	A (7)	M (6)	A (7)	R (3)	M (5)	A (8)+	M (6)+	A (8)	R (2)
188	Home-bound, ASA 1-2-3, Other Ipsilateral Injury	R (3)+	M (5)	M (6)	A (7)	R (3)	M (5)	A (7)	M (6)	A (7)	R (2)
189	Home-bound, ASA 4, No associated injuries	R (3)	A (7)+	M (6)	A (7)	R (3)	M (5)	A (7)	M (6)+	A (7)	R (2)+
190	Home-bound, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)+	M (5)+	M (5)+	A (7)	M (6)	M (6)	R (3)+
191	Home-bound, ASA 4, Median nerve injury	R (2)	A (7)+	M (6)	A (7)	R (3)	M (5)	A (8)	M (6)	A (7)	R (2)+
192	Home-bound, ASA 4, Other Ipsilateral Injury	R (3)	A (7)+	M (6)	A (7)+	R (3)	M (5)	A (7)	M (6)	A (7)	R (2)+
193	Functionally Independent, ASA 1-2-3, No associated injuries	R (1)+	R (3)	M (6)	A (7)	R (3)	M (5)	A (8)+	A (7)	A (8)	R (2)
194	Functionally Independent, ASA 1-2-3, Grade I or II Open Fracture	R (1)	R (3)+	M (6)	A (7)+	M (5)	M (6)	A (7)+	A (7)	A (7)+	R (3)+
195	Functionally Independent, ASA 1-2-3, Median nerve injury	R (1)+	R (3)	A (7)	A (7)	R (2)	M (5)	A (8)+	M (6)	A (7)	R (2)+
196	Functionally Independent, ASA 1-2-3, Other Ipsilateral Injury	R (1)	R (3)	A (7)	A (7)	R (3)	M (5)	A (8)+	M (6)	A (8)	R (2)+
197	Functionally Independent, ASA 4, No associated injuries	R (2)	A (7)	M (6)	A (7)	R (3)	M (4)	A (7)	M (6)	A (7)	R (2)
198	Functionally Independent, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	A (7)+	M (5)	M (5)	M (6)	M (6)	M (6)	R (3)+
199	Functionally Independent, ASA 4, Median nerve injury	R (1)+	A (7)	M (6)	M (6)	R (2)	M (4)	A (7)+	M (6)	A (7)	R (2)
200	Functionally Independent, ASA 4, Other Ipsilateral Injury	R (1)	A (7)	M (6)	M (6)	R (3)	M (5)	A (7)	M (6)	A (7)	R (2)+
201	Normal Functioning, ASA 1-2-3, No associated injuries	R (2)+	R (3)	M (6)	M (6)	M (5)	M (6)	A (8)+	M (6)	A (8)	R (2)
202	Normal Functioning, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (2)+	M (6)+	A (7)+	M (5)+	M (6)	A (7)+	A (7)	A (7)+	R (3)+
203	Normal Functioning, ASA 1-2-3, Median nerve injury	R (1)+	R (3)	A (7)	A (7)	R (2)	M (6)	A (8)+	M (6)	A (8)	R (2)
204	Normal Functioning, ASA 1-2-3, Other Ipsilateral Injury	R (1)	M (4)	M (6)	M (6)	R (2)	M (6)	A (8)+	M (6)	A (8)	R (2)+
205	Normal Functioning, ASA 4, No associated injuries	R (2)	A (7)	M (6)	A (7)	R (2)	M (5)	A (7)	M (6)	A (7)	R (2)+
206	Normal Functioning, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	A (7)	A (7)+	M (5)	M (5)+	A (7)	M (6)	M (6)	R (3)+
207	Normal Functioning, ASA 4, Median nerve injury	R (1)+	A (7)	M (6)	A (7)	R (2)	M (5)	A (8)	M (5)	A (8)	R (2)+
208	Normal Functioning, ASA 4, Other Ipsilateral Injury	R (1)	A (7)	M (6)	A (7)	R (3)	M (5)	A (8)	M (6)	A (8)	R (2)+
209	High Functional Demands, ASA 1-2-3, No associated injuries	R (1)+	R (3)	M (6)	A (7)	M (4)	M (6)	A (9)+	M (6)	A (9)+	R (2)+
210	High Functional Demands, ASA 1-2-3, Grade I or II Open Fracture	R (1)+	R (1)+	M (6)	A (7)+	M (5)+	M (6)	A (7)+	A (7)	A (7)+	R (3)+
211	High Functional Demands, ASA 1-2-3, Median nerve injury	R (1)+	R (3)	M (6)	A (7)	R (2)	M (5)	A (8)+	M (6)	A (8)	R (2)+
212	High Functional Demands, ASA 1-2-3, Other Ipsilateral Injury	R (1)+	M (4)	M (6)	A (7)	R (2)	M (6)	A (8)+	M (6)	A (9)	R (2)+
213	High Functional Demands, ASA 4, No associated injuries	R (2)+	A (7)	M (6)	A (7)	R (2)	M (5)	A (7)	M (6)+	A (8)	R (2)+
214	High Functional Demands, ASA 4, Grade I or II Open Fracture	R (1)+	R (3)+	M (6)	A (7)+	M (5)+	M (6)+	A (7)	M (6)	M (6)	M (4)+
215	High Functional Demands, ASA 4, Median nerve injury	R (1)+	A (7)	M (6)	A (7)	R (2)	M (5)	A (8)	M (6)	A (8)	R (2)+
216	High Functional Demands, ASA 4, Other Ipsilateral Injury	R (2)+	A (7)	M (6)	A (7)	M (4)	M (6)	A (8)	M (6)+	A (7)	R (3)+

* R=Rarely Appropriate, M=May be Appropriate, A=Appropriate; Numbers in parentheses indicate median rating of voting panel; "+" =Agreement between voting panel members, "-" = Disagreement between voting panel members

V. LITERATURE REVIEW FINDINGS

APPROPRIATE USE CRITERIA
FOR TREATMENT OF DISTAL RADIUS FRACTURES
Literature Review

LIST OF TABLES

CHAPTER 1: FUSED EPIPHYSIS

Patients in chapter one of this AUC had fused radial epiphysis (see Tables 1 and 2). All patients were candidates for conservative treatment. The systematic review looked at which treatment led to a better patient's outcome, rigid cast or less rigid immobilization (such as removable wrap or brace). Five Level II randomized controlled trials met the inclusion criteria. There were significant differences in pain at 5-6, 8, and 24 weeks, in favor of casting. All other durations of follow-up did not have significant differences between patients treated with rigid immobilization and those treated with less-rigid immobilization.

Table 1. Fused Radial Epiphysis

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Tumia	329	Age: 60, 281F 68M, Fused radial epiphysis, a unilateral colles fracture, Dorsal angulation more than 3mm and radial loss of more than 4° required manipulation	II	Pain	10 days	○*
Moir	79	Age: 21-86, 70F 9M, Fused radial epiphysis Median Frykman score V-VI in cast group,	II		10 - 14 days	○*
Tumia	182	Same as above	II		5 weeks	○*
Moir	79		II		5 - 6 weeks	cast*
Moir	79		II		8 weeks	cast*
Tumia	182		II		8 weeks	○*
Tumia	182		II		12 weeks	○*
Moir	79		II		13 weeks	○*
Tumia	182		II		24 weeks	cast*
Moir	79		II		26 weeks	○*
Moir	79	Same as above	II	Complications	n/a	cast
Ledingham	57	Age: 60, 25F 5M, Fused radial epiphysis requiring manipulation/reduction	II			
Bunger	136	Sex: 125F 20M, Frykmann's classification, I and II: 43, III and IV:24, V and VI: 30, VIII and VIII:39	II			
Stewart	235	Age:60, Sex 207F 36M,	II			

Table 2. Fused Radial Epiphysis

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
O'Connor	66	Age: 57, Sex: 44F 22M, Colles fracture not requiring manipulation	II	Pain	1 week	○
Tumia	329	Age: 60, 281F 68M, Fused radial epiphysis, a unilateral colles fracture, Dorsal angulation more than 3mm and radial loss of more than 4° required manipulation	II		10 days	○
Abbaszadegan	68	Undisplaced or minimally displaced Colles fracture,Axial shortening less than 2mm, Frykman's Classification I and II:19, III and IV:10, V and VI:30, VII and VIII:9	II		11 days	○
O'Connor	66	Same as above	II		2 weeks	cast
Davis	52	Age: 55, Sex: 43F 11M, <10° of dorsal angulation	II		4 weeks	○
Abbaszadegan	68	Same as above	II		4 weeks	○
Tumia	329		II		5 weeks	○
O'Connor	66		II		6 weeks	brace
Davis	52		II		6 weeks	○
Abbaszadegan	68		II		8 weeks	brace*
Tumia	329		II		8 weeks	○
Tumia	329		II		12 weeks	○
Tumia	329		II		24 weeks	○
Abbaszadegan	68		II		1 year	○
Davis	52		II	Function	> 5 weeks	○

Table 2. Fused Radial Epiphysis

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
O'Connor	66		II	Complications	n/a	○
Tumia	329		II			
Abbaszadegan	68		II			
Davis	52		II			

* Reported by study author(s);
○ No significant difference

CHAPTER 2: POST REDUCTION RADIAL SHORTENING >3MM, DORSAL TILT >10°

Chapter two of this AUC contained operative treatment options for fractures with post reduction radial shortening >3mm and dorsal tilt of >10 degrees, or fractures with intra-articular displacement or step off >2mm as opposed to cast fixation (see Table 3). Five randomized clinical trials that compared fixation to cast immobilization are included as evidence for this chapter. All trials had at least one methodological flaw and were downgraded to Level II. All trials mixed articular fractures and extra-articular fractures in a manner which did not allow for separate analysis. There were no age criteria. The average patient age in these trials was similar to trials that address treatment in older-aged patients. There were differences in pain at 24 and 52 weeks, but not at 8 and 12 weeks in one study, differences in motion at 52 weeks in one study, and differences in complications overall, in 4 studies. The differences were all in favor of operative treatment. Complications included carpal tunnel syndrome, thumb pain, ulnar nerve symptoms, and malunion. The moderate strength of the data is, therefore, based primarily on differences in complications, which can be somewhat variably defined.

The amount of pain in patients treated with external fixation was not significantly different from the pain in patients treated with casting at 8 or 12 weeks post-operatively, but was significantly lower at 24 weeks post-operatively and remained significant up to 1 year. However, the number of patients that were pain free after 7 years was not significantly different between external fixation and casting. Additionally, function was significantly better in patients treated by external fixation after 1 year, but not significantly different at 8, 12, or 24 weeks.

There are several complications reported in the studies. Seven of the eleven studies reported that complications did not occur significantly more or less in patients treated with cast or external fixation. Statistically significant differences between patients treated with operative fixation and those treated with casting favored patients treated with external fixation (fewer occurrences of malunion, CTS, ulnar nerve symptoms, and thumb pain). However, there are complications unique to external fixation that patients treated with casting are not exposed to.

Table 3. Post Reduction Radial Shortening >3mm, Dorsal Tilt >10°

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Abbaszadegan	46	Age: 63, Sex: 36F, 11M Fracture type: Older 3 and 4, Radial compression of 5mm or more	II	Pain	8 weeks	○
Abbaszadegan	46		II		12 weeks	○
Abbaszadegan	46		II		24 weeks	Ex-fix*
Abbaszadegan	46		II		52 weeks	Ex-fix*
Young	85	Age: 29-82, Sex: 66F 19M, >10° dorsal angulation or greater than 2mm radial shortening, Frykman grade 1&2: 38 3&4: 19, 5&6:12, 7&8:16	II		7 years	○
Abbaszadegan	46	Age: 63, Sex: 36F, 11M Fracture type: Older 3 and 4, Radial compression of 5mm or more	II	Function	8 weeks	○
Abbaszadegan	46		II		12 weeks	○
Abbaszadegan	46		II		24 weeks	○
Abbaszadegan	46		II		52 weeks	Ex-fix*
McQueen	120	Age: 63, Sex: 107F 13M, >10° dorsal angulation or greater than 3mm radial shortening, AO Classifications: A3.2:48, C2.1:46, C2.2:4, C2.3:2, C3.2:20	II	Complications	n/a	Ex-fix
Howard	50	>30° dorsal angulation or greater than 1cm radial shortening	II			
Young	85	Age: 29-82, Sex: 66F 19M, >10° dorsal angulation or greater than 2mm radial shortening, Frykman grade 1&2: 38 3&4: 19, 5&6:12, 7&8:16	II			
Pring	76	NR	II			

* Reported by study author(s), Ex-fix: External fixation, ○: No significant difference

CHAPTER 3: SURGICAL TREATMENT OF DISTAL RADIUS FRACTURE

Fourteen clinical trials are included for the chapter on surgical procedure for this AUC: 8 combined intra and extra-articular fractures, 5 studied only intra-articular fractures, and one studied only extra-articular fractures (see Tabled 4-16). No studies evaluated shearing/articular rim fractures or radiocarpal fracture-dislocations. Inclusion was based on inadequate radiographic alignment after initial adequate closed reduction and splint immobilization. Thus, the included studies did not allow for stratification by fracture type. Only two comparisons were made by more than one study, making meta-analysis impossible. All had at least one methodological flaw and were downgraded to Level II.

The included studies in this recommendation do not address many important aspects of the operative treatment of distal radius fractures, including different operative treatments for different fracture types. Therefore, it is not possible to come to an evidence-based conclusion for the optimal operative treatment of distal radius fractures.

Only three of 14 studies had statistically significant findings. In one study, there was only a statistically significant difference in complications. In another study, there was a possibly clinically important difference in DASH at 1 year but not at 3 or 6 months. In the third study, there was statistically significant better function at 2 years for percutaneous fixation over ORIF. All other outcomes evaluated by the included studies were not statistically significant.

Chapter: Closed reduction and percutaneous fixation vs. open reduction and internal fixation. Review identified one randomized controlled trial comparing closed reduction and percutaneous fixation to open reduction and internal fixation (ORIF). Patients treated with closed reduction and percutaneous fixation had significantly better function and no difference in pain. Tendon rupture occurred significantly less in patients treated with closed reduction and percutaneous fixation. No other complication reported by the authors was statistically significant.

Chapter: Non-bridging vs. **b**ridging external fixation. The review identified three randomized controlled trials comparing non-bridging external fixation to bridging external fixation. Function and pain determined by the DASH score showed no significant difference between groups. This result is a true negative, suggesting that patients treated with non-bridging external fixation or bridging external fixation had similar outcomes 1 year after surgery. Pain measured by visual analog scale (VAS) up to 1 year was not significantly different in patients treated with non-bridging or bridging external fixation pain at different anatomic locations on or around the distal radius was not significantly different in patients treated with non-bridging or bridging external fixation. Statistically significant complications occurred in favor of non-bridging external fixation and in favor of bridging external fixation. Tendon rupture occurred significantly more in patients treated with non-bridging external fixation. Malunion occurred significantly more in patients treated with bridging external fixation.

Chapter: Augmented bridging external fixation vs. bridging external fixation.
One randomized controlled trial compared augmented bridging external fixation (by addition of a fifth external fixator pin) to bridging external fixation. The study did not report validated patient oriented outcomes. There were no statistically significant differences in the occurrence of

complications between patients treated with augmented bridging external fixation or bridging external fixation.

Chapter: Augmented bridging external fixation vs. plate
We identified one randomized controlled trial comparing augmented bridging external fixation to plate fixation. Activity at final follow-up was similar in patients treated with augmented external fixation or plate fixation. Statistically significant complications occurred in favor of augmented bridging external fixation and in favor of plate(s) Median nerve symptoms occurred significantly more often in patients treated with plate fixation, and radial nerve symptoms occurred significantly more often in patients treated with external fixation. Additionally, infection of pin tracts was reported in patients treated with external fixation. Patients treated by plate fixation are not subject to this complication.

Chapter: Augmented bridging external fixation vs. volar locking plate
One randomized controlled trial compared augmented bridging external fixation to volar locking plate fixation. At 1 year, the DASH results were possibly clinically important and patients treated with volar locking plates had better function than patients treated with augmented external fixation. However, pain at 1 year was not significantly different between these groups of patients. There were no statistically significant differences in complications between patients treated with augmented bridging external fixation and patients treated with volar locking plate fixation However, both interventions have unique complications.

Chapter: Bridging external fixation vs. Medullary pinning.
We identified one randomized controlled trial comparing bridging external fixation to medullary pinning. The study did not report validated patient oriented outcomes, but reports complications. There were significantly more occurrences of infection, median nerve symptoms, and shoulder pain in patients treated with external fixation than those treated with medullary pinning.

Chapter: Dorsal locking plates vs. dual plates
We identified one randomized controlled trial comparing dorsal locking plate fixation to dual plate fixation. Pain at 6 months after surgery was similar between the two groups and there was no statistically significant difference in return to activities for patients treated with a dorsal locking plate or dual plates.

Table 4. Closed Reduction and Percutaneous Fixation vs. ORIF

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Kreder	118	Age: 40, Sex: 70F 48M, AO classification AOB:24, AO-C:155	II	Function	2 years	**Closed reduction & percutaneous fixation**
Kreder	118		II	Pain	2 years	○

Table 5. Non-bridging vs. Bridging External Fixation

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Krukhaug	71	>10° of dorsal angulation, and/or radial shortening of more than 2mm, 32 patients treated with plaster cast which failed to maintain reduction (Malailignment more than 5° or a shortening radius of more than 2mm) at 10 day follow up.	II	Function	1 year	true negative
Krishnan	60	Age: 57, Sex: 41F 19M, AO calcification A3.2: 3. B2.1:1, AO C:56, C3.2:32, Other AO C 24	II	Pain	6 weeks	○
Krishnan	60		II		26 weeks	○
McQueen	56	Same as below	II		1 year	○
Krukhaug	71	>10° of dorsal angulation, and/or radial shortening of more than 2mm, 32 patients treated with plaster cast which failed to maintain reduction (Malailignment more than 5° or a shortening radius of more than 2mm) at 10 day follow up.	II	Complications	n/a	○
Krishnan	60	Same as above	II			
McQueen	56	Age: 61 Sex: 55F 5M, AO classification system: A3.2: 44, C2.1:14, A3.3: 2	II			

Table 6. Augmented Bridging External Fixation vs. Percutaneous Pinning

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Harley	41	Age: 42, Sex 28F 22M, AO classidication: A3: 9 C2:17, C3:24	II	Function	6 months	true negative
Harley	41		II	Physical health	6 months	○
Harley	33		II		12 months	○
Harley	41		II	Mental health	6 months	○
Harley	33		II		12 months	○

Table 7. Augmented Bridging External Fixation vs. Bridging External Fixation

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Werber	50	Age: 58, Sex 35F 15M, AO classification: A2.2:3, A3.1:3, A3.2:14, C2.1:11, C2.2:17, C2.3:2	II	Complications	n/a	○

Table 8. VLP vs. Conservative Treatment of Cast

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of follow-up	Favored treatment
Arora	73	Age:76, F55, M18, AO classification A2:6, A3:16, C1:15, C2:20,C3:16	II	Extension	12 Months	○
				Flexion	12 Months	○
				Supination	12 Months	○
				Pronation	12 Months	○
				Ulnar deviation	12 Months	○
				Radial deviation	12 Months	○
				Grip Strength	12 Months	VLP
				Pain at rest (VAS)	12 Months	○
				Pain under stress (VAS)	12 Months	○
				DASH	12 Months	○
				PRWE	12 Months	○

○: no significant difference

Table 9. Augmented Bridging External Fixation vs. Plate(s)

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Leung	144	Age: 45, Sex: 52F 85M, AO classification: C1:36, C2:50, C3:58	II	Activity	Final follow-up	○
Leung	144		II	Complications	n/a	○

○: No significant difference

Table 10. Augmented Bridging External Fixation vs. Volar Locking Plate

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Egol	77	Age:50, Sex: 47F 30M, AO classifications: AoA:46, B:3 C:43	II	Function	3 months	true negative
Egol	77		II		6 months	true negative
Egol	77		II		1 year	possibly clinically important favoring **VLP**
Egol	77		II	Pain	3 months	○
Egol	77		II		6 months	○
Egol	77		II		1 year	○
Egol	77		II	Complications	n/a	○

Table 11. Closed Reduction and Percutaneous Pinning vs. Open Reduction and Internal Fixation (VLP)

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Rozental 2009	42	Age: 51.5, Sex: 33F,11M, AO classification: A2:6, A3:10, C1:8 C2:20	II	Grip strength (kg)	6 weeks	VLP
					9 weeks	VLP
					12 weeks	○
					1 year	○
			II	Pinch strength (kg)	6 weeks	VLP
					9 weeks	VLP
					12 weeks	○
					1 year	○
			II	Digital motion to palm (mm)	6 weeks	○
					9 weeks	○
					12 weeks	○
					1 year	○
			II	DASH score (points)	6 weeks	VLP
					9 weeks	VLP
					12 weeks	○
					1 year	○
McFadyen 2011	56	Age: 18-80, Sex: 33F, 23M, Dorsal angulation >20°, radial shortening 4mm. AO classification: AO A:56	II	DASH	3 months	VLP
					6 months	VLP
				Gartland and Werley	3 months	VLP
					6 months	VLP

Table 12. External Fixation vs. Volar Locking Plate

Study	N	Patient's Profile	Level Of Evidence	Outcome	Duration of Follow-up	Favored Treatment
Wilcke 2011	63	Age: 55.5, Sex: 48F 15M, AO classification AO C:15 AO A:48	II	DASH	3 months	VLP
					6 months	VLP
					12 months	○
				PRWE	3 months	VLP
					6 months	VLP
					12 months	○
				Grip strength	3 months	VLP
					6 months	VLP
					12 months	○
				Extension	3 months	VLP
					6 months	VLP
					12 months	VLP
				Flexion	3 months	VLP
					6 months	○
					12 months	○
				Ulnar deviation	3 months	VLP
					6 months	○
					12 months	VLP
				Radial deviation	3 months	○
					6 months	○
					12 months	○
				Supination	3 months	VLP
					6 months	VLP
					12 months	VLP
				Pronation	3 months	VLP
					6 months	VLP
					12 months	VLP

○:No significant difference

Table 13. VLP With or Without Calcium Phosphate Bone Cement

Study	N	Patient's Profile	Level Of Evidence	Outcome	Duration of Follow-up	Favored Treatment
Kim	50	Age: 73, Sex:40F 8M, AO classification A3:20, B3:3, C1:5, C2:18, C3:4	II	Flexion	3 months	○
					1 year	○
				Extension	3 months	○
					1 year	○
				Supination	3 months	○
					1 year	○
				Pronation	3 months	○
					1 year	○
				Grip strength (Kg)	3 months	○
					1 year	○
				VAS score	3 months	○
					1 year	○
				DASH score	3 months	○
					1 year	○

Comparing VLP alone and VLP and calcium phosphate bone cement

○:No significant difference

Table 14. Bridging External Fixation vs. Medullary Pinning

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Pritchett	100	Age: 66 medain, Sex: 55F, 45M, Frykman type VIII,	II	Complications	n/a	**Medullary pinning**

Table 15. Bridging External Fixation vs. Pins and Plaster

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Raskin	60	Age: 45, AO group C	II	Activity	Final follow-up	○
Raskin	60		II	Complications	n/a	○
Hutchinson	85	Age: 65, Dorsal angulation greater than 20°, Frykman type V to VIII	II			

Table 16. Dorsal Locking Plate vs. Dual Plating

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Hahnloser	46	Age: 55, Sex: 35F,11MDorsal angulation greater than 20° Loss of radial length >10mm, AO classification AO A3:18, C1:8, C2:7, C3:13	II	Pain	6 months	○
Hahnloser	46		II	Activity	6 months	○

CHAPTER 4: C1, C2, C3 ARTHROSCOPIC EVALUATION IN PATIENTS WITH OTHER ASSOCIATED INJURIES.

Only one of two studies was sufficiently powered to detect the minimum clinically important difference (see Table 17). In this study, arthroscopy assisted reduction of the articular surface. In the arthroscopy group, the DASH scores were clinically improved at the three-month interval. Regardless of arthroscopy, the difference in function as determined by DASH scores was inconclusive at 1 and 2 years post-operatively.

Table 17. C1, C2, C3 Arthroscopic Evaluation in Patients With Other Associated Injuries

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Varitimidis	40	Age:46, Sex: 23F 17M, AO fracture types C1, C2, or C3	II	Function	3 months	Arthroscopic*
Varitimidis	40		II		12 months	inconclusive
Varitimidis	40		II		24 months	inconclusive

* Clinically important difference compared to fluoroscopic

CHAPTER 5: CONCURRENT TREATMENT OF DISTAL RADIOULNAR JOINT INSTABILITY IN PATIENTS WITH OPERATIVELY TREATED DISTAL RADIUS FRACTURE.

Two studies investigated the functional outcome of DRUJ injuries (see Table 18). The instabilities were identified at the conclusion of treatment. Therefore, no instabilities were treated at the time of surgery. Although the patients with instability had poorer outcomes, neither study addressed the question of whether early operative intervention is indicated.

We identified one prospective non-randomized study that compared patients with unstable DRUJ after distal radius fixation to patients with a stable DRUJ after distal radius fixation. Patients with unstable DRUJ had significantly more pain at rest and on loading than those patients with a stable DRUJ.

We also identified an additional prospective non-randomized study comparing patients with a distal radius fracture involving the DRUJ to those with a fracture not involving the DRUJ. Significantly more patients without involvement of the DRUJ were pain free 6 weeks after treatment of their distal radius fracture. The authors report that this significant difference remained at 6 months and 1 year (chi-square, $p < 0.05$).

Table 18. Concurrent Surgical Treatment of Distal Radioulnar Joint Instability in Patients With Operatively Treated Distal Radius Fracture

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Group
Lindau	76	Age:23-52, 41F 35M, 67 treated with plaster cast and 9 surgical treatment	II	Pain	1 year	Stable DRUJ
Roysam	170	Age:62.7, 81 involving DRUJ, and 89 without DRUJ	III		6 weeks	No DRUJ Involvement
Roysam	170				6 months	No DRUJ Involvement
Roysam	170				1 year	No DRUJ Involvement

CHAPTER 6: FIXATION OF ULNAR STYLOID FRACTURES ASSOCIATED WITH DISTAL RADIUS FRACTURES.

One study found no difference between treatment (fixation) and no treatment (see Table 19). The other study identified ulna styloid fractures after treatment was completed. The study found that there were clinically important differences between patients with and without styloid fractures. Therefore, no ulna styloid fractures were treated at the time of surgery. Although the patients with ulna styloid fractures had poorer outcomes, the study did not address the question of whether early operative intervention is indicated. Therefore, we found no conclusive evidence to recommend operative or non-operative treatment for the ulna styloid fracture.

We identified one randomized controlled trial comparing patients treated operatively for a concomitant ulna fracture to patients treated conservatively for a concomitant ulnar fracture. There was no significant difference between the numbers of patients that were pain free 2 years after treatment.

Additionally, we identified a single prospective non-randomized study that compared patients without a concomitant ulna fracture to patients with a concomitant fracture of the base or tip of the ulna. The patients with concomitant ulnar fractures did not receive any treatment for their ulnar fracture. Therefore, the comparison between the groups in this study determines the effect of an untreated concomitant ulnar fracture on the outcome. Patients without a concomitant ulna fracture had clinically important differences in function, as determined by the DASH instrument, compared to those with a concomitant ulna fracture. Additionally, there was no significant difference between patients with and without a concomitant ulna fracture in the occurrence of ulnar wrist pain at final follow-up.

Table 19. Fixation of Ulnar Styloid Fractures Associated With Distal Radius Fractures

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Group
Ekenstam	40	Age: 51, Sex: 31F 10M, 19 Treated with closed manipulation followed by suturing of the triangular stabilization of the ulnar styloid, 22 patients treated with closed reduction and plaster cast.	II	Pain	2 years	○
Zenke	118	Age: 64.1, Sex: 90F 28M, Treated with internal fixation VLP, >5° dorsal tilt, <20°radial inclination angle, >2mm ulnar variance contralateral or intra-articular step of >1mm. AO Classification AO A2:29, A3:31. AO C1:17 C2:31 C3:10	II	Pain	Final follow-up	○
Zenke	118			Function	1 week	no ulnar fx*
Zenke	118				2 weeks	no ulnar fx*
Zenke	118				4 weeks	no ulnar fx*
Zenke	118				8 weeks	no ulnar fx*
Zenke	118				12 weeks	no ulnar fx*
Zenke	118				24 weeks	no ulnar fx*

* Clinically important difference compared to patients with ulnar fracture

○: No significant difference

CHAPTER 7: AGE > 55 YEARS

We were interested in determining the role of operative treatment compared to non-operative treatment of patients, defined by the published literature as “elderly”, and that distinguished patients based on infirmity, functional demands, bone quality, or energy of injury. Three clinical trials met the inclusion criteria (see Table 20). Two trials compared external fixation to cast immobilization and one trial compared percutaneous pinning to cast immobilization. All trials had at least one methodological flaw and were downgraded to Level II. One trial addressed extra-articular fractures, one addressed articular fractures, and one addressed both. Age criteria included age over 55 in 2 studies and over age 60 in one study. We selected the age of 55 because these included studies that enrolled patients no younger than 55 years. We were unable to identify studies that distinguished patients based on infirmity, functional demands, bone quality, or energy of injury. Inclusion was based on redisplacement in one study, initial radiographic alignment in one study, and instability not otherwise defined in one study. There were no differences in pain, function, complications or SF-36 at any time point.

The amount of pain experienced after 1 year was not significantly different in patients treated with percutaneous pinning or with a cast. There was also no significant difference in overall mental or physical health, as determined by the SF-36 score, and no significant difference in the occurrence of complications in patients treated with percutaneous pinning or cast. However, percutaneous pinning does have complications that those patients treated with casts are not subject to.

Both randomized controlled trials that compared patients treated with external fixation to those treated with cast and over the age of 55 found no statistically significant differences for pain experienced at different anatomic locations on or around the distal radius or with different amounts of activity after 1 year. No statistically significant differences, for various functional activities, between patients treated with external fixation or casting and over the age of 55 were present after 1 year.

Table 20. Age>55

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Treatment
Azzopardi	57	Age: 72, Sex: 48F 6M, AO Classification AO-A3 or Frykman types I and II	II	Pain	1 year	○*
Azzopardi	57			Mental health	1 year	○*
Azzopardi	57			Physical health	1 year	○*
Azzopardi	57			Complications	n/a	○*
Hegeman	32	Same as below	II	Pain	6 weeks	○**
Hegeman	32				3 months	○**
Roumen	101	Age: 70, 93F 8M, Frykman type: II:2, V:22, VI:36, VII:9, VIII:32	II		26 weeks	○**
Hegeman	32	Age: 70 29F 3M, Dorsal angulation of more than 10° and radial inclination of less than 20°, and a positive ulnar variance of more than 3mm	II		1 year	○**
Hegeman	32			Function	6 weeks	○**
Hegeman	32				3 months	○**
Hegeman	32				1 year	○**
Foldhazy	59	Age:72, Sex: 53F 6M, AO classification A2:6, A3:21, C1:1, C2:15, C3:8	II	Green & Obrian/Conney score	1 year	○**
Foldhazy	59			VAS	2 months	○**
Foldhazy	59				6 months	○**
Foldhazy	59				1 year	○**
Foldhazy	59			Grip strength	2 months	○**
Foldhazy	59				6 months	○**
Foldhazy	59				1 year	○**
Wong	60	Age: 70, 49F 11M, Frykman's classification: I:36, II:25	II	Overall WHOQoL	1 year	○*
Wong	60			Total score (100)	6 year	○*

*Comparing percutaneous pinning to casting ** comparing external fixation to casting

○: No significant difference

CHAPTER 8: EARLY WRIST IMMOBILIZATION

Three studies were included for this chapter. Each study investigated different operative treatment methods: volar plate, trans-styloid fixation, or external fixation (see Table 21). Mobilization was commenced at different times. In the two internal fixation studies, therapy started approximately at 1 week. In the external fixation study, mobilization commenced at 3 weeks. In 2 studies, the control group was either casted or immobilized with a fixator. In the volar plating study, the control group was immobilized by a thermoplastic splint that they were instructed to remove for showering and, therefore, are not a reliable control group.

The outcome measures used were pain and function (DASH) and/or complications. None of the outcomes were significantly different between early motion and late motion. These data support the recommendation that patients do not need to begin early wrist motion after stable fracture fixation.

There is no difference (true negative) in function determined by the DASH score up to 6 months between patients with early wrist motion and those with late wrist motion. There is also no significant difference between the amount of pain experienced by patients with early wrist motion and those with late wrist motion. No significant differences in the occurrence of complications between patients with early wrist motion or patients with late wrist motion were seen in any of the trials.

Table 21. Wrist Immobilization

Study	n	Patient's Profile	Level of Evidence	Outcome Domain	Duration of Follow-up	Favored Group
Allain	60	Age: 53, Sex: 49F 11M, AO classification: A2:28, A3:17, C1:8, C2:7, K wire and Cast	II	Pain	4 weeks	○
Lozano-Calderon	56	Age:55, Sex:39F, 21M, AO classification C:29, A:22, B:8	II		3 months	true negative
Lozano-Calderon	54		II		6 months	true negative
Allain	60	Same as above	II		1 year	○
Lozano-Calderon	56		II	Function	3 months	○
Lozano-Calderon	54		II		6 months	○
Lozano-Calderon	56		II	Complications	n/a	○
Allain	60		II			○
McQueen	54		II			○

○: No significant difference

LITERATURE REVIEW REFERENCES

Abbaszadegan H, Conradi P, Jonsson U. Fixation not needed for undisplaced Colles' fracture. *Acta Orthop Scand* 1989;60(1):60-62.

Abbaszadegan H, Jonsson U. External fixation of plaster cast for severely displaced Colles' fractures? Prospective 1-year study of 46 patients. *Acta Orthopaedica Scandinavica* 1990;61(6):528-530.

Allain J, le GP, Le MS, Goutallier D. Trans-styloid fixation of fractures of the distal radius. A prospective randomized comparison between 6- and 1-week postoperative immobilization in 60 fractures. *Acta Orthop Scand* 1999;70(2):119-123.

Arora R, Lutz M, Deml C, Krappinger D, Haug L, Gabl M. A prospective randomized trial comparing nonoperative treatment with volar locking plate fixation for displaced and unstable distal radial fractures in patients sixty-five years of age and older. *J Bone Joint Surg Am* 2011;93-A(23):2146-2153.

Azzopardi T, Ehrendorfer S, Coulton T, Abela M. Unstable extra-articular fractures of the distal radius: a prospective, randomised study of immobilisation in a cast versus supplementary percutaneous pinning. *J Bone Joint Surg Br* 2005;87(6):837-840.

Bunger C, Solund K, Rasmussen P. Early results after Colles' fracture: functional bracing in supination vs dorsal plaster immobilization. *Arch Orthop Trauma Surg* 1984;103(4):251-256.

Davis TR, Buchanan JM. A controlled prospective study of early mobilization of minimally displaced fractures of the distal radial metaphysis. *Injury* 1987;18(4):283-285.

Egol K, Walsh M, Tejwani N, McLaurin T, Wynn C, Paksima N. Bridging external fixation and supplementary Kirschner-wire fixation versus volar locked plating for unstable fractures of the distal radius: a randomised, prospective trial. *J Bone Joint Surg Br* 2008;90(9):1214-1221.

af Ekenstam F., Jakobsson OP, Wadin K. Repair of the triangular ligament in Colles' fracture. No effect in a prospective randomized study. *Acta Orthop Scand* 1989;60(4):393-396.

Foldhazy Z, Ahrengart L. External fixation versus closed treatment of displaced distal radial fractures in elderly patients: a randomized controlled trial. *Current Orthopaedic Practice* 2010;21(3):288-295.

Hahnloser D, Platz A, Amgwerd M, Trentz O. Internal fixation of distal radius fractures with dorsal dislocation: pi-plate or two 1/4 tube plates? A prospective

randomized study. *J Trauma* 1999;47(4):760-765.

Harley BJ, Scharfenberger A, Beaupre LA, Jomha N, Weber DW. Augmented external fixation versus percutaneous pinning and casting for unstable fractures of the distal radius--a prospective randomized trial. *J Hand Surg [Am]* 2004;29(5):815-824.

Hegeman JH, Oskam J, van der PJ, Ten Duis HJ, Vierhout PAM. Primary external fixation versus plaster immobilization of the intra-articular unstable distal radial fracture in the elderly. *Aktuelle Traumatologie* 2004;34(2):64-70.

Howard PW, Stewart HD, Hind RE, Burke FD. External fixation or plaster for severely displaced comminuted Colles' fractures? A prospective study of anatomical and functional results. *Journal of Bone and Joint Surgery - Series B* 1989;71(1):68-73.

Hutchinson DT, Strenz GO, Cautilli RA. Pins and plaster vs external fixation in the treatment of unstable distal radial fractures. A randomized prospective study. *J Hand Surg [Br]* 1995;20(3):365-372.

Kim JK, Koh YD, Kook SH. Effect of calcium phosphate bone cement augmentation on volar plate fixation of unstable distal radius fractures in the elderly. *J Bone Joint Surg Am* 2011;93-A(7):609-14.

Kreder HJ, Hanel DP, Agel J et al. Indirect reduction and percutaneous fixation versus open reduction and internal fixation for displaced intra-articular fractures of the distal radius: a randomised, controlled trial. *J Bone Joint Surg Br* 2005;87(6):829-836.

Krishnan J, Wigg AE, Walker RW, Slavotinek J. Intra-articular fractures of the distal radius: a prospective randomised controlled trial comparing static bridging and dynamic non-bridging external fixation. *J Hand Surg [Br]* 2003;28(5):417-421.

Krukhaug Y, Ugland S, Lie SA, Hove LM. External fixation of fractures of the distal radius: a randomized comparison of the Hoffman compact II non-bridging fixator and the Dynawrist fixator in 75 patients followed for 1 year. *Acta Orthop* 2009;80(1):104-108.

Ledingham WM, Wytch R, Goring CC, Mathieson AB, Wardlaw D. On immediate functional bracing of Colles' fracture. *Injury* 1991;22(3):197-201.

Leung F, Tu YK, Chew WY, Chow SP. Comparison of external and percutaneous pin fixation with plate fixation for intra-articular distal radial fractures. A randomized study. *J Bone Joint Surg Am* 2008;90(1):16-22.

Lindau T, Hagberg L, Adlercreutz C, Jonsson K, Aspenberg P. Distal radioulnar

instability is an independent worsening factor in distal radial fractures. *Clin Orthop Relat Res* 2000;(376):229-235.

Lozano-Calderon SA, Souer S, Mudgal C, Jupiter JB, Ring D. Wrist mobilization following volar plate fixation of fractures of the distal part of the radius. *J Bone Joint Surg Am* 2008;90(6):1297-1304.

McFadyen I, Field J, McCann P, Ward J, Nicol S, Curwen C. Should unstable extra-articular distal radial fractures be treated with fixed-angle volar-locked plates or percutaneous Kirschner wires? A prospective randomised controlled trial. *Injury* 2011;42(2):162–166.

McQueen MM. Redisplaced unstable fractures of the distal radius. A randomised, prospective study of bridging versus non-bridging external fixation. *J Bone Joint Surg Br* 1998;80(4):665-669.

McQueen MM, Hajducka C, Court-Brown CM. Redisplaced unstable fractures of the distal radius: a prospective randomised comparison of four methods of treatment. *J Bone Joint Surg Br* 1996;78(3):404-409.

Moir JS, Murali SR, Ashcroft GP, Wardlaw D, Matheson AB. A new functional brace for the treatment of Colles' fractures. *Injury* 1995;26(9):587-593.

O'Connor D, Mullett H, Doyle M, Mofidi A, Kutty S, O'Sullivan M. Minimally displaced Colles' fractures: a prospective randomized trial of treatment with a wrist splint or a plaster cast. *J Hand Surg [Br]* 2003;28(1):50-53.

Pring DJ, Barber L, Williams DJ. Bipolar fixation of fractures of the distal end of the radius: a comparative study. *Injury* 1988;19(3):145-148.

Pritchett JW. External fixation or closed medullary pinning for unstable Colles fractures? *Journal of Bone and Joint Surgery - Series B* 1995;77(2):267-269.

Raskin KB, Melone CP, Jr. Unstable articular fractures of the distal radius. Comparative techniques of ligamentotaxis. *Orthop Clin North Am* 1993;24(2):275-286.

Roumen RMH, Hesp WLEM, Bruggink EDM. Unstable Colles' fractures in elderly patients. A randomised trial of external fixation for redisplacement. *Journal of Bone and Joint Surgery - Series B* 1991;73(2):307-311.

Roysam GS. The distal radio-ulnar joint in Colles' fractures. *J Bone Joint Surg Br* 1993;75(1):58-60.

Rozental TD, Blazar PE, Franko OI, Chacko AT, Earp BE, Day CS. Functional outcomes for unstable distal radial fractures treated with open reduction and internal fixation or closed reduction and percutaneous fixation. *J Bone Joint Surg Am* 2009;91-A(8):1837-1846.

Stewart HD, Innes AR, Burke FD. Functional cast-bracing for Colles' fractures. A comparison between cast-bracing and conventional plaster casts. *J Bone Joint Surg Br* 1984;66(5):749-753.

Tumia N, Wardlaw D, Hallett J, Deutman R, Mattsson SA, Sanden B. Aberdeen Colles' fracture brace as a treatment for Colles' fracture. A multicentre, prospective, randomised, controlled trial. *J Bone Joint Surg Br* 2003;85(1):78-82.

Varitimidis SE, Basdekis GK, Dailiana ZH, Hantes ME, Bargiotas K, Malizos K. Treatment of intra-articular fractures of the distal radius: fluoroscopic or arthroscopic reduction? *J Bone Joint Surg Br* 2008;90(6):778-785.

Werber KD, Raeder F, Brauer RB, Weiss S. External fixation of distal radial fractures: four compared with five pins: a randomized prospective study. *J Bone Joint Surg Am* 2003;85-A(4):660-666.

Wilcke MKT, Abbaszadegan H, Adolphson PY. Wrist function recovers more rapidly after volar locked plating than after external fixation but the outcomes are similar after 1 year: A randomized study of 63 patients with a dorsally displaced fracture of the distal radius. *Acta Orthopaedica* 2011;82(1):76–81.

Wong TC, Chiu Y, Tsang WL, Leung WY, Yam SK, Yeung SH. Casting versus percutaneous pinning for extra-articular fractures of the distal radius in an elderly Chinese population: a prospective randomized controlled trial. *Journal of Hand Surgery [European Volume]* 2010;35E(3):202–208.

Young CF, Nanu AM, Checketts RG. Seven-year outcome following Colles' type distal radial fracture. A comparison of two treatment methods. *J Hand Surg [Br]* 2003;28(5):422-426.

Zenke Y, Sakai A, Oshige T, Moritani S, Nakamura T. The effect of an associated ulnar styloid fracture on the outcome after fixation of a fracture of the distal radius. *J Bone Joint Surg Br* 2009;91(1):102-107.

VI. APPENDICES

APPENDIX A. DOCUMENTATION OF APPROVAL

AAOS BODIES THAT APPROVED THIS APPROPRIATE USE CRITERIA

AUC Section: Approved on February 21st, 2013
The AAOS Appropriate Use Criteria Section consists of six AAOS members. The overall purpose of this Section is to plan, organize, direct and evaluate initiatives related to Appropriate Use Criteria.

Council on Research and Quality: Approved on February 26th, 2013
To enhance the mission of the AAOS, the Council on Research and Quality promotes the most ethically and scientifically sound basic, clinical, and translational research possible to ensure the future care for patients with musculoskeletal disorders. The Council also serves as the primary resource to educate its members, the public, and public policy makers regarding evidenced-based medical practice, orthopaedic devices and biologics regulatory pathways and standards development, patient safety, occupational health, technology assessment, and other related areas of importance.

Board of Directors: Approved on March 18th, 2013
The 16 member AAOS Board of Directors manages the affairs of the AAOS, sets policy, and determines and continually reassesses the Strategic Plan.

APPENDIX B. LIST OF CLINICAL SCENARIOS

These scenarios are a result of combining every possible combination of the indications created by the writing panel. Please comment on any scenarios that you think may not be represented in this matrix or scenarios that may not be seen in clinical practice.

Scenario #	Scenario
1	Type A, High-energy, Home-bound, ASA 1-2-3, No associated injuries
2	Type A, High-energy, Home-bound, ASA 1-2-3, Grade I or II Open Fracture
3	Type A, High-energy, Home-bound, ASA 1-2-3, Grade III Open Fracture
4	Type A, High-energy, Home-bound, ASA 1-2-3, Median nerve injury
5	Type A, High-energy, Home-bound, ASA 1-2-3, Other Ipsilateral Injury
6	Type A, High-energy, Home-bound, ASA 4, No associated injuries
7	Type A, High-energy, Home-bound, ASA 4, Grade I or II Open Fracture
8	Type A, High-energy, Home-bound, ASA 4, Grade III Open Fracture
9	Type A, High-energy, Home-bound, ASA 4, Median nerve injury
10	Type A, High-energy, Home-bound, ASA 4, Other Ipsilateral Injury
11	Type A, High-energy, Independent, ASA 1-2-3, No associated injuries
12	Type A, High-energy, Independent, ASA 1-2-3, Grade I or II Open Fracture
13	Type A, High-energy, Independent, ASA 1-2-3, Grade III Open Fracture
14	Type A, High-energy, Independent, ASA 1-2-3, Median nerve injury
15	Type A, High-energy, Independent, ASA 1-2-3, Other Ipsilateral Injury
16	Type A, High-energy, Independent, ASA 4, No associated injuries
17	Type A, High-energy, Independent, ASA 4, Grade I or II Open Fracture
18	Type A, High-energy, Independent, ASA 4, Grade III Open Fracture
19	Type A, High-energy, Independent, ASA 4, Median nerve injury
20	Type A, High-energy, Independent, ASA 4, Other Ipsilateral Injury
21	Type A, High-energy, Normal, ASA 1-2-3, No associated injuries
22	Type A, High-energy, Normal, ASA 1-2-3, Grade I or II Open Fracture
23	Type A, High-energy, Normal, ASA 1-2-3, Grade III Open Fracture
24	Type A, High-energy, Normal, ASA 1-2-3, Median nerve injury
25	Type A, High-energy, Normal, ASA 1-2-3, Other Ipsilateral Injury
26	Type A, High-energy, Normal, ASA 4, No associated injuries
27	Type A, High-energy, Normal, ASA 4, Grade I or II Open Fracture
28	Type A, High-energy, Normal, ASA 4, Grade III Open Fracture
29	Type A, High-energy, Normal, ASA 4, Median nerve injury
30	Type A, High-energy, Normal, ASA 4, Other Ipsilateral Injury
31	Type A, High-energy, High, ASA 1-2-3, No associated injuries
32	Type A, High-energy, High, ASA 1-2-3, Grade I or II Open Fracture
33	Type A, High-energy, High, ASA 1-2-3, Grade III Open Fracture
34	Type A, High-energy, High, ASA 1-2-3, Median nerve injury
35	Type A, High-energy, High, ASA 1-2-3, Other Ipsilateral Injury
36	Type A, High-energy, High, ASA 4, No associated injuries

37	Type A, High-energy, High, ASA 4, Grade I or II Open Fracture
38	Type A, High-energy, High, ASA 4, Grade III Open Fracture
39	Type A, High-energy, High, ASA 4, Median nerve injury
40	Type A, High-energy, High, ASA 4, Other Ipsilateral Injury
41	Type A, Low-energy, Home-bound, ASA 1-2-3, No associated injuries
42	Type A, Low-energy, Home-bound, ASA 1-2-3, Grade I or II Open Fracture
43	Type A, Low-energy, Home-bound, ASA 1-2-3, Median nerve injury
44	Type A, Low-energy, Home-bound, ASA 1-2-3, Other Ipsilateral Injury
45	Type A, Low-energy, Home-bound, ASA 4, No associated injuries
46	Type A, Low-energy, Home-bound, ASA 4, Grade I or II Open Fracture
47	Type A, Low-energy, Home-bound, ASA 4, Median nerve injury
48	Type A, Low-energy, Home-bound, ASA 4, Other Ipsilateral Injury
49	Type A, Low-energy, Independent, ASA 1-2-3, No associated injuries
50	Type A, Low-energy, Independent, ASA 1-2-3, Grade I or II Open Fracture
51	Type A, Low-energy, Independent, ASA 1-2-3, Median nerve injury
52	Type A, Low-energy, Independent, ASA 1-2-3, Other Ipsilateral Injury
53	Type A, Low-energy, Independent, ASA 4, No associated injuries
54	Type A, Low-energy, Independent, ASA 4, Grade I or II Open Fracture
55	Type A, Low-energy, Independent, ASA 4, Median nerve injury
56	Type A, Low-energy, Independent, ASA 4, Other Ipsilateral Injury
57	Type A, Low-energy, Normal, ASA 1-2-3, No associated injuries
58	Type A, Low-energy, Normal, ASA 1-2-3, Grade I or II Open Fracture
59	Type A, Low-energy, Normal, ASA 1-2-3, Median nerve injury
60	Type A, Low-energy, Normal, ASA 1-2-3, Other Ipsilateral Injury
61	Type A, Low-energy, Normal, ASA 4, No associated injuries
62	Type A, Low-energy, Normal, ASA 4, Grade I or II Open Fracture
63	Type A, Low-energy, Normal, ASA 4, Median nerve injury
64	Type A, Low-energy, Normal, ASA 4, Other Ipsilateral Injury
65	Type A, Low-energy, High, ASA 1-2-3, No associated injuries
66	Type A, Low-energy, High, ASA 1-2-3, Grade I or II Open Fracture
67	Type A, Low-energy, High, ASA 1-2-3, Median nerve injury
68	Type A, Low-energy, High, ASA 1-2-3, Other Ipsilateral Injury
69	Type A, Low-energy, High, ASA 4, No associated injuries
70	Type A, Low-energy, High, ASA 4, Grade I or II Open Fracture
71	Type A, Low-energy, High, ASA 4, Median nerve injury
72	Type A, Low-energy, High, ASA 4, Other Ipsilateral Injury
73	Type B, High-energy, Home-bound, ASA 1-2-3, No associated injuries
74	Type B, High-energy, Home-bound, ASA 1-2-3, Grade I or II Open Fracture
75	Type B, High-energy, Home-bound, ASA 1-2-3, Grade III Open Fracture
76	Type B, High-energy, Home-bound, ASA 1-2-3, Median nerve injury
77	Type B, High-energy, Home-bound, ASA 1-2-3, Other Ipsilateral Injury

78	Type B, High-energy, Home-bound, ASA 4, No associated injuries
79	Type B, High-energy, Home-bound, ASA 4, Grade I or II Open Fracture
80	Type B, High-energy, Home-bound, ASA 4, Grade III Open Fracture
81	Type B, High-energy, Home-bound, ASA 4, Median nerve injury
82	Type B, High-energy, Home-bound, ASA 4, Other Ipsilateral Injury
83	Type B, High-energy, Independent, ASA 1-2-3, No associated injuries
84	Type B, High-energy, Independent, ASA 1-2-3, Grade I or II Open Fracture
85	Type B, High-energy, Independent, ASA 1-2-3, Grade III Open Fracture
86	Type B, High-energy, Independent, ASA 1-2-3, Median nerve injury
87	Type B, High-energy, Independent, ASA 1-2-3, Other Ipsilateral Injury
88	Type B, High-energy, Independent, ASA 4, No associated injuries
89	Type B, High-energy, Independent, ASA 4, Grade I or II Open Fracture
90	Type B, High-energy, Independent, ASA 4, Grade III Open Fracture
91	Type B, High-energy, Independent, ASA 4, Median nerve injury
92	Type B, High-energy, Independent, ASA 4, Other Ipsilateral Injury
93	Type B, High-energy, Normal, ASA 1-2-3, No associated injuries
94	Type B, High-energy, Normal, ASA 1-2-3, Grade I or II Open Fracture
95	Type B, High-energy, Normal, ASA 1-2-3, Grade III Open Fracture
96	Type B, High-energy, Normal, ASA 1-2-3, Median nerve injury
97	Type B, High-energy, Normal, ASA 1-2-3, Other Ipsilateral Injury
98	Type B, High-energy, Normal, ASA 4, No associated injuries
99	Type B, High-energy, Normal, ASA 4, Grade I or II Open Fracture
100	Type B, High-energy, Normal, ASA 4, Grade III Open Fracture
101	Type B, High-energy, Normal, ASA 4, Median nerve injury
102	Type B, High-energy, Normal, ASA 4, Other Ipsilateral Injury
103	Type B, High-energy, High, ASA 1-2-3, No associated injuries
104	Type B, High-energy, High, ASA 1-2-3, Grade I or II Open Fracture
105	Type B, High-energy, High, ASA 1-2-3, Grade III Open Fracture
106	Type B, High-energy, High, ASA 1-2-3, Median nerve injury
107	Type B, High-energy, High, ASA 1-2-3, Other Ipsilateral Injury
108	Type B, High-energy, High, ASA 4, No associated injuries
109	Type B, High-energy, High, ASA 4, Grade I or II Open Fracture
110	Type B, High-energy, High, ASA 4, Grade III Open Fracture
111	Type B, High-energy, High, ASA 4, Median nerve injury
112	Type B, High-energy, High, ASA 4, Other Ipsilateral Injury
113	Type B, Low-energy, Home-bound, ASA 1-2-3, No associated injuries
114	Type B, Low-energy, Home-bound, ASA 1-2-3, Grade I or II Open Fracture
115	Type B, Low-energy, Home-bound, ASA 1-2-3, Median nerve injury
116	Type B, Low-energy, Home-bound, ASA 1-2-3, Other Ipsilateral Injury
117	Type B, Low-energy, Home-bound, ASA 4, No associated injuries
118	Type B, Low-energy, Home-bound, ASA 4, Grade I or II Open Fracture

119	Type B, Low-energy, Home-bound, ASA 4, Median nerve injury
120	Type B, Low-energy, Home-bound, ASA 4, Other Ipsilateral Injury
121	Type B, Low-energy, Independent, ASA 1-2-3, No associated injuries
122	Type B, Low-energy, Independent, ASA 1-2-3, Grade I or II Open Fracture
123	Type B, Low-energy, Independent, ASA 1-2-3, Median nerve injury
124	Type B, Low-energy, Independent, ASA 1-2-3, Other Ipsilateral Injury
125	Type B, Low-energy, Independent, ASA 4, No associated injuries
126	Type B, Low-energy, Independent, ASA 4, Grade I or II Open Fracture
127	Type B, Low-energy, Independent, ASA 4, Median nerve injury
128	Type B, Low-energy, Independent, ASA 4, Other Ipsilateral Injury
129	Type B, Low-energy, Normal, ASA 1-2-3, No associated injuries
130	Type B, Low-energy, Normal, ASA 1-2-3, Grade I or II Open Fracture
131	Type B, Low-energy, Normal, ASA 1-2-3, Median nerve injury
132	Type B, Low-energy, Normal, ASA 1-2-3, Other Ipsilateral Injury
133	Type B, Low-energy, Normal, ASA 4, No associated injuries
134	Type B, Low-energy, Normal, ASA 4, Grade I or II Open Fracture
135	Type B, Low-energy, Normal, ASA 4, Median nerve injury
136	Type B, Low-energy, Normal, ASA 4, Other Ipsilateral Injury
137	Type B, Low-energy, High, ASA 1-2-3, No associated injuries
138	Type B, Low-energy, High, ASA 1-2-3, Grade I or II Open Fracture
139	Type B, Low-energy, High, ASA 1-2-3, Median nerve injury
140	Type B, Low-energy, High, ASA 1-2-3, Other Ipsilateral Injury
141	Type B, Low-energy, High, ASA 4, No associated injuries
142	Type B, Low-energy, High, ASA 4, Grade I or II Open Fracture
143	Type B, Low-energy, High, ASA 4, Median nerve injury
144	Type B, Low-energy, High, ASA 4, Other Ipsilateral Injury
145	Type C, High-energy, Home-bound, ASA 1-2-3, No associated injuries
146	Type C, High-energy, Home-bound, ASA 1-2-3, Grade I or II Open Fracture
147	Type C, High-energy, Home-bound, ASA 1-2-3, Grade III Open Fracture
148	Type C, High-energy, Home-bound, ASA 1-2-3, Median nerve injury
149	Type C, High-energy, Home-bound, ASA 1-2-3, Other Ipsilateral Injury
150	Type C, High-energy, Home-bound, ASA 4, No associated injuries
151	Type C, High-energy, Home-bound, ASA 4, Grade I or II Open Fracture
152	Type C, High-energy, Home-bound, ASA 4, Grade III Open Fracture
153	Type C, High-energy, Home-bound, ASA 4, Median nerve injury
154	Type C, High-energy, Home-bound, ASA 4, Other Ipsilateral Injury
155	Type C, High-energy, Independent, ASA 1-2-3, No associated injuries
156	Type C, High-energy, Independent, ASA 1-2-3, Grade I or II Open Fracture
157	Type C, High-energy, Independent, ASA 1-2-3, Grade III Open Fracture
158	Type C, High-energy, Independent, ASA 1-2-3, Median nerve injury
159	Type C, High-energy, Independent, ASA 1-2-3, Other Ipsilateral Injury

160	Type C, High-energy, Independent, ASA 4, No associated injuries
161	Type C, High-energy, Independent, ASA 4, Grade I or II Open Fracture
162	Type C, High-energy, Independent, ASA 4, Grade III Open Fracture
163	Type C, High-energy, Independent, ASA 4, Median nerve injury
164	Type C, High-energy, Independent, ASA 4, Other Ipsilateral Injury
165	Type C, High-energy, Normal, ASA 1-2-3, No associated injuries
166	Type C, High-energy, Normal, ASA 1-2-3, Grade I or II Open Fracture
167	Type C, High-energy, Normal, ASA 1-2-3, Grade III Open Fracture
168	Type C, High-energy, Normal, ASA 1-2-3, Median nerve injury
169	Type C, High-energy, Normal, ASA 1-2-3, Other Ipsilateral Injury
170	Type C, High-energy, Normal, ASA 4, No associated injuries
171	Type C, High-energy, Normal, ASA 4, Grade I or II Open Fracture
172	Type C, High-energy, Normal, ASA 4, Grade III Open Fracture
173	Type C, High-energy, Normal, ASA 4, Median nerve injury
174	Type C, High-energy, Normal, ASA 4, Other Ipsilateral Injury
175	Type C, High-energy, High, ASA 1-2-3, No associated injuries
176	Type C, High-energy, High, ASA 1-2-3, Grade I or II Open Fracture
177	Type C, High-energy, High, ASA 1-2-3, Grade III Open Fracture
178	Type C, High-energy, High, ASA 1-2-3, Median nerve injury
179	Type C, High-energy, High, ASA 1-2-3, Other Ipsilateral Injury
180	Type C, High-energy, High, ASA 4, No associated injuries
181	Type C, High-energy, High, ASA 4, Grade I or II Open Fracture
182	Type C, High-energy, High, ASA 4, Grade III Open Fracture
183	Type C, High-energy, High, ASA 4, Median nerve injury
184	Type C, High-energy, High, ASA 4, Other Ipsilateral Injury
185	Type C, Low-energy, Home-bound, ASA 1-2-3, No associated injuries
186	Type C, Low-energy, Home-bound, ASA 1-2-3, Grade I or II Open Fracture
187	Type C, Low-energy, Home-bound, ASA 1-2-3, Median nerve injury
188	Type C, Low-energy, Home-bound, ASA 1-2-3, Other Ipsilateral Injury
189	Type C, Low-energy, Home-bound, ASA 4, No associated injuries
190	Type C, Low-energy, Home-bound, ASA 4, Grade I or II Open Fracture
191	Type C, Low-energy, Home-bound, ASA 4, Median nerve injury
192	Type C, Low-energy, Home-bound, ASA 4, Other Ipsilateral Injury
193	Type C, Low-energy, Independent, ASA 1-2-3, No associated injuries
194	Type C, Low-energy, Independent, ASA 1-2-3, Grade I or II Open Fracture
195	Type C, Low-energy, Independent, ASA 1-2-3, Median nerve injury
196	Type C, Low-energy, Independent, ASA 1-2-3, Other Ipsilateral Injury
197	Type C, Low-energy, Independent, ASA 4, No associated injuries
198	Type C, Low-energy, Independent, ASA 4, Grade I or II Open Fracture
199	Type C, Low-energy, Independent, ASA 4, Median nerve injury
200	Type C, Low-energy, Independent, ASA 4, Other Ipsilateral Injury

201	Type C, Low-energy, Normal, ASA 1-2-3, No associated injuries
202	Type C, Low-energy, Normal, ASA 1-2-3, Grade I or II Open Fracture
203	Type C, Low-energy, Normal, ASA 1-2-3, Median nerve injury
204	Type C, Low-energy, Normal, ASA 1-2-3, Other Ipsilateral Injury
205	Type C, Low-energy, Normal, ASA 4, No associated injuries
206	Type C, Low-energy, Normal, ASA 4, Grade I or II Open Fracture
207	Type C, Low-energy, Normal, ASA 4, Median nerve injury
208	Type C, Low-energy, Normal, ASA 4, Other Ipsilateral Injury
209	Type C, Low-energy, High, ASA 1-2-3, No associated injuries
210	Type C, Low-energy, High, ASA 1-2-3, Grade I or II Open Fracture
211	Type C, Low-energy, High, ASA 1-2-3, Median nerve injury
212	Type C, Low-energy, High, ASA 1-2-3, Other Ipsilateral Injury
213	Type C, Low-energy, High, ASA 4, No associated injuries
214	Type C, Low-energy, High, ASA 4, Grade I or II Open Fracture
215	Type C, Low-energy, High, ASA 4, Median nerve injury
216	Type C, Low-energy, High, ASA 4, Other Ipsilateral Injury

APPENDIX C. DISCLOSURE INFORMATION

Participant	1 Royalties from a company or supplier	2 Speaker bureau/paid presentations for a company or supplier	3A Paid employee for a company or supplier	3B Paid consultant for a company or supplier	3C Unpaid consultant for a company or supplier	4 Stock or stock options in a company or supplier	5 Research support from a company or supplier as a PI	6 Other financial or material support from publishers	7 Royalties, financial or material support from publishers	8 Medical/Orthopaedic publications editorial/governing board	9 Board member/committee appointments for a society
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Julie E. Adams, MD	DePuy	*	*	Arthrex, Inc; Depuy; Articulinx	Synthes	*	*	*	Saunders/ Mosby-Elsevier	Saunders/Mosby-Elsevier	AAHS; MOS; ASES; ASSH; AANA
Brett D. Crist, MD	*	Medtronic; Sonoma	*	KCI	*	Amedica Corporation; Orthopaedic Implant Company	Medtronic; Sonoma; Synthes; Wound Care Technologies	*	*	Jounal of Orthopaedic Trauma; Jounal of American Academy of Orthopaedic Surgeons; Orthoinfo.org	Mid-Central States Orthopaedic Society; OTA
Charles A. Goldfarb, MD	*	*	*	*	*	*	*	*	Wolters Kluwer Health-Lippincott Williams & Wilkins	*	*
John J. McGraw, MD	*	*	*	Amedysis Home Health Agency	*	*	*	*	*	*	*
Miguel A. Pirela-Cruz, MD	*	Trimed	*	*	*	*	*	*	*	*	AAHS; ABOS; ASSH
David C. Ring, MD	Wright Medical Technology, Inc.	*	*	Biomet; Wright medical Technology, Inc.	*	Illuminos	*	*	*	Journal of Hand Surgery-American; Journal of Orthopaedic Trauma	ASES; ASSH
Jaiyoung Ryu, MD	*	*	*	*	*	*	*	*	*	Springer	AAHS
Paul Tornetta III, MD	Smith & Nephew	*	*	*	*	*	*	*	Wolters Kluwer Health-Lippincott Williams & Wilkins	Journal of Orthopaedic Trauma	*

*No Disclosure Item Reported

Participant	1 Royalties from a company or supplier	2 Speaker bureau/paid presentations for a company or supplier	3A Paid employee for a company or supplier	3B Paid consultant for a company or supplier	3C Unpaid consultant for a company or supplier	4 Stock or stock options in a company or supplier	5 Research support from a company or supplier as a PI	6 Other financial or material support from publishers	7 Royalties, financial or material support from publishers	8 Medical/Orthopaedic publications editorial/governing board	9 Board member/committee appointments for a society
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Jeffrey E. Budoff, MD	Trimed	*	*	*	Trimed	*	*	*	Elsevier Science	Journal of Hand Surgery-American; Journal of Bone and Joint Surgery-American	ASSH
Peter J. Evans, MD, PhD	Biomet	Axogen; Small Bone Innovations	*	Axogen; Small Bone Innovations	Biopro	Nutek	*	*	*	*	*
Daren Forward, MD	*	*	*	*	*	*	*	*	*	*	*
Jeffrey Friedrich, MD		*	*	*	*	*	*	*	*	*	*
M. Felix Freshwater, MD	*	*	*	*	*	*	*	*	*	Journal of Hand Surgery-British; Saunders/Mosby-Elsevier; Springer	*
Kenneth J. Koval, MD	Biomet	Biomet; Stryker	*	Biomet	*	*	*	*	Wolters Kluwer Health-Lippincott Williams & Wilkins	Journal of Orthopaedics and Traumatology	AAOS; OTA
Donald H. Lee, MD	Biomet	*	*	*	*	*	Biomet	Biomet	Elsevier	Journal of Hand Surgery- American	AAOS; ASSH; ABJS
Jose J. Monsivais, MD	Waiting on updated disclosure										
Jay F. Pomerance, MD	*	Pfizer; Wyeth	*	Gerson Lehrman; Wyeth	*	*	*	*	*	Journal of Hand Surgery- American	ASSH
J. Andrew I Trenholm	*	*	*	*	*	*	*	*	*	*	*
Boris A. Zelle, MD	*	Synthes	*	*	*	*	*	*	*	*	AAOS

*No Disclosure Item Reported

Participant	1 Royalties from a company or supplier	2 Speaker bureau/paid presentations for a company or supplier	3A Paid employee for a company or supplier	3B Paid consultant for a company or supplier	3C Unpaid consultant for a company or supplier	4 Stock or stock options in a company or supplier	5 Research support from a company or supplier as a PI	6 Other financial or material support from publishers	7 Royalties, financial or material support from publishers	8 Medical/Orthopaedic publications editorial/governing board	9 Board member/committee appointments for a society
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Henry A. Backe Jr, MD	*	Auxilium	*	*	*	*	*	*	*	*	EOA
George W. Balfour, MD	Innomed	Sonicsurg Innovations	*	*	*	*	*	*	*	*	COA
Warren C. Hammert, MD	*	*	*	Synthes	*	*	*	*	*	*	*
Robert C. Kramer, MD	*	*	*	*	*	*	*	*	*	*	*
David Leu, MD	*	*	*	*	*	*	*	*	*	*	*
Peter J. Stern, MD	*	*	*	*	*	*	*	*	*	Journal of Bone and Joint Surgery-American	*
Steven Strode, MD	*	*	*	*	*	*	*	*	*	*	AAFP; AR Academy of Family Physicians; AR Medical Society; Southern Medical Association
Walter H. Truong, MD	*	*	*	*	*	*	*	*	*	*	*

*No Disclosure Item Reported

APPENDIX D. REFERENCES

Reference List

(1) Fitch K, Bernstein SJ, Aguilar MD et al. *The RAND/UCLA Appropriateness Method User's Manual*. Santa Monica, CA: RAND Corporation; 2001.

(2) Chen NC, Jupiter JB. Management of distal radial fractures. *J Bone Joint Surg Am* 2007;89(9):2051-2062.

(3) Court-Brown CM, Caesar B. Epidemiology of adult fractures: A review. *Injury* 2006;37(8):691-697.

(4) Kakarlapudi TK, Santini A, Shahane SA, Douglas D. The cost of treatment of distal radial fractures. *Injury* 2000;31(4):229-232.

(5) Agency for Healthcare Research and Quality. Healthcare Cost and Utilization Project Nationwide Inpatient Sample. *HCUP NIS* 2007.

(6) Xavier C, Molin D, Marins dos Santos R, Torre dos Santos R, Neto J. Surgical Treatment of Distal Radius Fractures with a Volar Locked Plate: Correlation of Clinical and Radiographic Results. Rev Bras Ortop. 2011;46(5):505-13.