An Evaluation of the Rotator Cuff Repair Research Pipeline

Jake X. Checketts,*† BS, Jared Scott,† BS, Josh Gordon,‡ DO, Jaclyn Jones,§ DO, Jarryd Horn,† MEd, Michelle Farabough,† MSKM, Jake Whitener,§ DO, Marshall Boose,§ DO, and Matt Vassar,† PhD

Investigation performed at Oklahoma State University Center for Health Sciences, Tulsa, Oklahoma, USA

Background: We conducted a study of recommendations from the American Academy of Orthopaedic Surgeons (AAOS) guideline, "Optimizing the Management of Rotator Cuff Problems." Using these recommendations, we conducted searches of clinical trial registries and bibliographic databases to note the extent to which new research has been undertaken to address areas of deficiency.

Hypothesis: Newly conducted research regarding rotator cuff repair and injury is available that will fill knowledge gaps identified by the AAOS guideline.

Study Design: Cross-sectional study.

Methods: For each recommendation in the AAOS guideline, we created PICO (participants, intervention, comparator, outcome) questions and search strings. Searches were conducted of ClinicalTrials.gov, the World Health Organization's International Clinical Trials Registry Platform, MEDLINE via PubMed, and EMBASE to locate studies undertaken after the final literature search performed by the AAOS work group.

Results: We located 210 newly registered trials and 448 published studies that are relevant to the recommendations made in the rotator cuff guideline. The majority of the recommendations have been addressed by relevant registered trials or published studies. Of the 448 published studies, 185 directly addressed the guideline recommendations. Additionally, 71% of the 185 published studies directly addressing the recommendations were randomized trials or systematic reviews/meta-analyses. The most important finding of our study was that the recommendations in the AAOS rotator cuff guideline have been adequately addressed.

Conclusion: Orthopaedic researchers have adequately addressed knowledge gaps regarding rotator cuff repair treatment and management options. As such, the AAOS may consider a guideline update to ensure that recommendations reflect current findings in orthopaedic literature.

Keywords: rotator cuff; shoulder; clinical practice guidelines; research gaps; research waste

Rotator cuff tears are the most common musculoskeletal shoulder injury.[8] These tears affect at least 10% of people over the age of 60 in the United States,[10] and it is estimated that 250,000 rotator cuff repairs are performed in the United States per year.[17] Furthermore, the volume of rotator cuff repairs is increasing. Colvin et al[7] reported an increase of 141% between 1996 and 2006, with arthroscopic procedures increasing by 600% and open repairs increasing by 34%. Treatment options for rotator cuff tears include nonoperative management, arthroscopic debridement with a biceps tenotomy or tenodesis, partial repair, complete repair, patch augmentation, superior capsular reconstruction, muscle-tendon transfer, and reverse total shoulder arthroplasty.[13] Given the high incidence of rotator cuff repairs and the diversity of treatment options, the American Academy of Orthopaedic Surgeons (AAOS) developed a clinical practice guideline that addressed the management of rotator cuff problems.[3] This evidence-based guideline

*Address correspondence to Jake X. Checketts, BS, Oklahoma State University Center for Health Sciences, 1111 W 17th St, Tulsa, OK 74107, USA (email: jake.checketts@okstate.edu).

†Oklahoma State University Center for Health Sciences, Tulsa, Oklahoma, USA.

‡Department of Anesthesiology, University of Oklahoma, Norman, Oklahoma, USA.

§Department of Orthopaedic Surgery, Oklahoma State University Medical Center, Tulsa, Oklahoma, USA.

The authors declared that they have no conflicts of interest in the authorship and publication of this contribution. AOSSM checks author disclosures against the Open Payments Database (OPD). AOSSM has not conducted an independent investigation on the OPD and disclaims any liability or responsibility relating thereto.

Ethical approval was not sought for the present study.

The Orthopaedic Journal of Sports Medicine, 6(11), 2325967118805731
DOI: 10.1177/2325967118805731

categorized evidence and assigned confidence to recommendations based on the quality of evidence that underpinned them; however, the majority of recommendations (55%) in the guideline were inconclusive. Even the most robust recommendations were classified as moderate. Criticisms surrounding potential bias and the large number of inconclusive recommendations ensued.[19,27] The American Orthopaedic Society of Sports Medicine, the Arthroscopy Association of North America, as well as specialty societies of the AAOS, such as the American Shoulder and Elbow Surgeons, expressed concerns culminating in a request by the Council of Specialty Societies that the AAOS not publish the guideline due to lack of evidence, risk of misinterpretation, and potential for misuse.[19] A continuous theme of these exchanges was the need for further research on rotator cuff disease. As Lubowitz et al[19] concluded, "The real conclusion of the Guideline is that future and better research is required."

Recommendations based on insufficient or inconclusive evidence ("moderate," "limited," "inconclusive," or "consensus statement" ratings) serve as the basis for identifying research gaps in rotator cuff research. Chalmers and Glasziou[6] estimated that up to 85% of research is wasted or of little value because of factors such as poor method, studies being underpowered, bias, and, pertinent to this study, addressing of the wrong research questions. In 2015, the Orthopaedic Research and Education Foundation (OREF) awarded US$2.5 million to 63 grant and award recipients.[24] A more well-established connection between the research gaps identified during guideline development and the research enterprise is a viable solution for reducing research waste in rotator cuff studies and could allow funders such as OREF to better allocate funding to areas where research and treatment guidelines are least conclusive. Recent editorials regarding rotator cuff repair methods covered in the AAOS guideline also suggest that addressing knowledge gaps in rotator cuff repair with high-quality, methodologically sound studies should be a priority.[9,11,23,25]

The primary purpose of the current study was to explore whether orthopaedic surgery researchers are addressing the research gaps identified by low-level recommendations in the AAOS clinical practice guideline, "Optimizing the Management of Rotator Cuff Problems."[3] Using recommendations from this guideline, we conducted searches of clinical trial registries, PubMed, and EMBASE to note the extent to which new, ongoing, and published research is being undertaken to address areas of deficiency. We hypothesized that the areas of deficiency in the rotator cuff guideline will have been addressed by new, ongoing, or published research.

TABLE 1
American Academy of Orthopaedic Surgeons Recommendation Classifications[a]

	Description
Strength of recommendation	
Strong	The benefits of the recommended approach clearly exceed the potential harm (or the potential harm clearly exceeds the benefits in the case of a strong negative recommendation), and the strength of the supporting evidence is high.
Moderate	The benefits exceed the potential harm (or the potential harm clearly exceeds the benefits in the case of a negative recommendation), but the strength of the supporting evidence is not as strong.
Limited	The quality of the supporting evidence that exists is unconvincing, or well-conducted studies show little clear advantage for one approach versus another.
Inconclusive	A lack of compelling evidence exists, resulting in an unclear balance between benefits and potential harm.
Consensus	Expert opinion supports the guideline recommendation, but there is no available empirical evidence meeting the inclusion criteria.
Evidence of recommendation	
Level 1	High-quality randomized trial with statistically significant difference or no statistically significant difference but narrow CIs; systematic reviews of level 1 RCTs (and study results) were homogenous.
Level 2	Lesser quality RCT (eg, <80% follow-up, no blinding, improper randomization); prospective comparative study; systematic review of level 2 studies or level 1 studies with inconsistent results.
Level 3	Case-control study, retrospective comparative study, or systematic review of level 3 studies.
Level 4	Case series.
Level 5	Expert opinion.

Source: American Academy of Orthopaedic Surgeons.[3]
[a]RCT, randomized controlled trial.

METHODS

Oversight and Reporting

We applied relevant Statistical Analyses and Methods in the Published Literature (SAMPL) reporting guidelines for reporting descriptive statistics.[18] These guidelines instruct authors on reporting basic statistical methods and results and were created to prevent most reporting deficiencies routinely found in published scientific reports.

We located the latest clinical practice guideline for rotator cuffs from the AAOS website.[3] The strength of recommendations ratings are located in Table 1. For each recommendation, we constructed 1 or more research

questions using the PICO (participants, intervention, comparator, outcome) format. This method is used to identify clinical components for systematic reviews and is endorsed by the Cochrane Collaboration.[14] It was chosen over other methods, as evidence suggests that the PICO method produces searches with greater sensitivity.[22] One investigator (M.F.) constructed all initial PICO questions, and 2 investigators (J.J., J.W.) reviewed them for accuracy and drafted the final questions.

Development of the Search Strings

For our study, we used the search strategies found in Table A3 of the AAOS guideline, which included search strings for PubMed and EMBASE.[2] The guideline work group did not perform searches of ClinicalTrials.gov or the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP); therefore, keywords from the PubMed and EMBASE search strings were used to construct search strings for these trial registries. Search strings were formulated leveraging Boolean operators (eg, OR, AND) and parenthetical groupings to optimize the use of key terms. Although both ClinicalTrials.gov and the WHO ICTRP databases use the Unified Medical Language System to enhance interoperability of vocabularies, their search engines work differently. For example, on ClinicalTrials .gov, a search using the term "pre hospital" (space between) returns records that include the word "pre-hospital" or "prehospital," whereas on the ICTRP site, the word "pre-hospital" (hyphenated) also returns the forms "pre-hospital" and "prehospital." For this reason, we developed 2 separate search strings for each clinical trial registry used in this study. We consulted Glanville et al[12] to accurately translate these search strings between the trial registries. We also consulted an expert on searching these trial registries to verify the accurate translation of our search strategy between the sites (M. Arber, personal communication, May 2017). The search strings used in this study are located in Appendix Table A1.

Searching the Trial Registries

Using the search strings for ClinicalTrials.gov, we retrieved studies using the "expert search" feature. Registry-listed information included study identification number, title, recruitment status, condition, intervention, phase, enrollment status, and study type.

Using the search strings for ICTRP, we retrieved studies using the basic search function. By performing a basic rather than advanced search, we were able to achieve a more sensitive search.[12] These studies were then added to those identified through ClinicalTrials.gov. After the 2 files were merged, duplicate studies were deleted, and the remaining studies were subject to screening.

Searching PubMed and EMBASE

Using the search strings for PubMed, we retrieved studies using the advanced search function, limiting the date range for included studies from October 2008 to July 24, 2017, when this study concluded. This date was chosen because October 1, 2008, was the final date included in the literature search for the guideline. Additionally, we limited the search to clinical trials, systematic reviews and meta-analyses, and observational studies. For EMBASE we used the same method; however, this database allows for limiting date only by year, so January 2008 was used as the start date for the search. Studies published between January 1 and October 1, 2008, were then omitted. We also applied an EMBASE limiter to search only for included studies not published in PubMed/MEDLINE to limit duplication.

Screening Studies for Eligibility

A single investigator (J.X.C.) screened studies for relevance. First, this investigator evaluated whether studies retrieved from the searches were relevant to rotator cuff injury and/or treatment. Studies that were not relevant were immediately excluded. Studies relevant to the PICO questions were retained, and those that were unclear were reviewed for relevance by 2 other investigators (M.V., J.J.), if needed. To qualify for inclusion, at least 1 of the study's arms had to fit the PICO question, either directly or indirectly (ie, data from the study could improve knowledge related to the research gaps even though the study did not directly address the research question). For example, recommendation 10B states, "We cannot recommend for or against the preferential use of suture anchors versus bone tunnels for repair of full-thickness rotator cuff tears." For a study to be designated as relevant to this recommendation, the study would have to include 1 arm or objective evaluating the outcomes of bone tunnels or suture anchors for full-thickness rotator cuff repair.

Second, we screened relevant studies by completion date. Only studies completed or published after the end of the literature search stated in the guideline (October 2008) and ongoing studies were included. After screening, studies were mapped to their corresponding recommendation (Appendix Tables A2 and A3).

Identification of Studies Directly Addressing the AAOS Recommendations

Next, all published studies determined as relevant to the guideline recommendations from our search of PubMed and EMBASE were separated, and the full-text versions of the manuscripts were screened. In this analysis, 3 authors (J.X.C., J.S., J.H.) determined whether studies directly addressed the recommendations in the guideline through at least 1 arm and therefore would aid in increasing the evidence base of the corresponding recommendation. For example, recommendation 10B states, "We cannot recommend for or against the preferential use of suture anchors versus bone tunnels for repair of full-thickness rotator cuff tears." For a study to be designated as one directly addressing this recommendation, it would have to include 1 arm or objective that directly compared the outcomes of bone tunnels against those of suture anchors for full-thickness rotator cuff repairs. Two investigators (J.C., J.S.)

independently screened the studies, each blinded to the other's determinations. Once screening was complete, consensus was reached among the authors, and a third author (J.H.) provided a third review of the studies to confirm accuracy. Next, the study type (eg, randomized trial, systematic review, meta-analysis) was evaluated to establish the quality of evidence among the studies directly addressing the recommendations.

Identification of Studies Funded by OREF

We evaluated studies funded by OREF to determine whether recently funded studies addressed the research gaps we identified from the clinical practice guideline. We used the 2013-2015 OREF Annual Reports[24] to gather the titles of all funded research projects. We included studies that indirectly addressed the recommendations and those that directly addressed recommendations. Only studies funded after the publication of the rotator cuff clinical practice guideline (2010) were included.

RESULTS

Results From Trial Registries

Our search of ClinicalTrials.gov and ICTRP yielded 868 studies; 409 studies were retrieved from ClinicalTrials.gov, and 459 trials were retrieved from the ICTRP database. After removing duplicate studies and those with completion dates prior to October 1, 2008, we were left with 532 studies (Figure 1).

Of the 532 studies included in our sample, 210 (39%) were relevant to the 25 recommendations made in the AAOS rotator cuff clinical practice guideline. Additionally, of the 25 recommendations made in the guideline, 24 (96%) were being addressed by new or ongoing research. The recommendation with the greatest number of new and/or ongoing trials was recommendation 4A, regarding patients with rotator cuff symptoms in the absence of a full tear being treated nonoperatively with exercise or nonsteroidal anti-inflammatory drugs. This recommendation was being addressed by 65 (31%) new or ongoing studies (Table 2). The recommendation with the next highest number of new and/or ongoing studies was recommendation 2, regarding the use of surgical rotator cuff repair in patients with symptomatic full-thickness tears, which was being addressed by 37 (18%) new and/or ongoing studies (Table 2). We found no new or ongoing studies evaluating recommendation 7B (the effects of diabetes, comorbidities, smoking, infection, and cervical disease on outcomes of rotator cuff surgery). The most common recruitment status for the 210 studies was "completed" (51; 24%), and the next most common recruitment status for the studies was "recruiting" (34; 16%) (Table 2).

Of the 210 registered trials determined as relevant to the recommendations in the guideline, only 99 (47%) have been updated as "completed" within their respective clinical trial registry database. Furthermore, of the 99 completed trials, only 17 (17%) were updated with the results of their study.

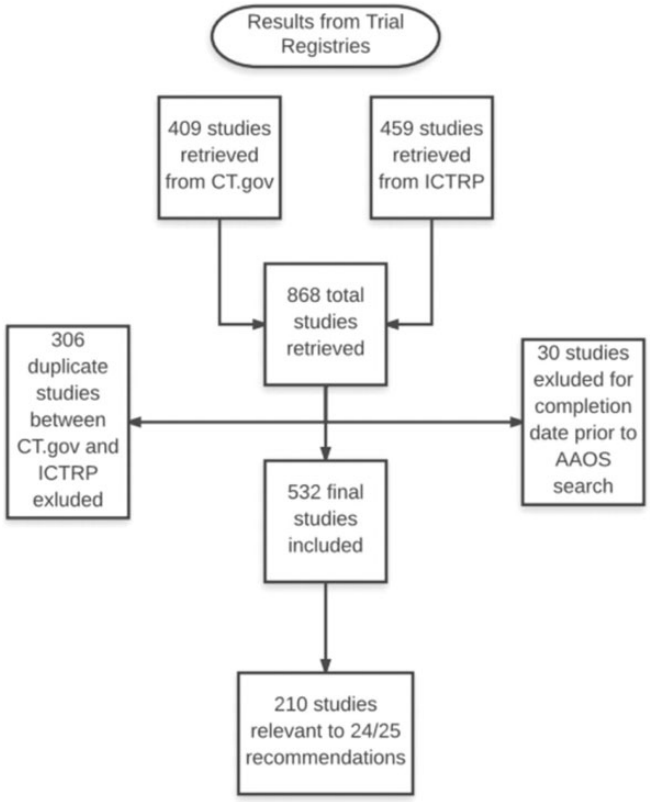

Figure 1. Flow diagram detailing the search results of ClinicalTrials.gov (CT.gov) and the World Health Organization International Clinical Trials Registry Platform (ICTRP). AAOS, American Academy of Orthopaedic Surgeons.

Results From PubMed and EMBASE

Our PubMed search yielded 1703 studies that were published between October 2008 and July 24, 2017. Our EMBASE search yielded 422 studies published between January 2008 and July 24, 2017. When combined, 2125 studies were screened for relevance. Of these, 448 (21%) were relevant to the 25 recommendations made in the guideline. Additionally, of the 25 recommendations made, all 25 (100%) were addressed by at least 1 published study (Figure 2). Recommendation 2, regarding the use of surgical rotator cuff repair in patients with symptomatic full-thickness tears, had the highest number of published studies (n = 158). The recommendation with the next highest number of published studies was recommendation 10C, regarding specific technique (arthroscopic, mini-open, or open repair) when surgical repair is indicated (n = 81) (Table 2).

Results of Full-Text Screening to Determine Studies Directly Addressing the AAOS Recommendations

Of the 448 published studies deemed relevant to the 25 recommendations made in the guideline, 185 (41%) were determined to directly address the recommendations in the

TABLE 2
AAOS Guideline Recommendations Addressed by New, Ongoing, or Published Research[a]

Recommendation	Level of Evidence	No. of Potential Trials in CT.gov/ ICTRP	No. of Completed Trials in CT.gov/ ICTRP (No. with results)	No. of Relevant Studies From PubMed and EMBASE	No. of Studies From PubMed and EMBASE Directly Addressing Recommendation
1. In the absence of reliable evidence, it is the opinion of the work group that surgery not be performed for asymptomatic, full-thickness rotator cuff tears.	Level 5, consensus	7	2 (0)	3	2
2. Rotator cuff repair is an option for patients with chronic, symptomatic full-thickness tears.	Level 4, limited	37	9 (2)	158	33
3A. We cannot recommend for or against exercise programs (supervised or unsupervised) for patients with rotator cuff tears.	Level 4, inconclusive	12	2 (0)	24	6
3B. We cannot recommend for or against subacromial injections for patients with rotator cuff tears.	Level 4, inconclusive	3	1 (1)	10	2
3C. We cannot recommend for or against the use of NSAIDs, activity modification, ice, heat, iontophoresis, massage, TENS, PEMF, or phonophoresis (ultrasound) for nonoperative management of rotator cuff tears.	None, inconclusive	2	1 (0)	12	0
4A. We suggest that patients who have rotator cuff–related symptoms in the absence of a full-thickness tear be initially treated nonoperatively using exercise and/or NSAIDs.	Level 2, moderate	65	23 (2)	73	10
4B. We cannot recommend for or against subacromial corticosteroid injection or PEMF in the treatment of rotator cuff-related symptoms in the absence of a full-thickness tear.	Level 2, inconclusive	21	7 (3)	47	20
4C. We cannot recommend for or against the use of iontophoresis, phonophoresis, TENS, ice, heat, massage, or activity modification for patients who have rotator cuff–related symptoms in the absence of a full-thickness tear.	None, inconclusive	19	9 (0)	47	24
5. Early surgical repair after acute injury is an option for patients with a rotator cuff tear.	Level 4, limited	4	2 (0)	1	0
6. We cannot recommend for or against the use of perioperative subacromial corticosteroid injections or NSAIDs in patients undergoing rotator cuff surgery.	Insufficient, inconclusive	3	0 (0)	1	1
7A. It is an option for physicians to advise patients that the following factors correlate with less favorable outcomes after rotator cuff surgery: age, atrophy/ fatty degeneration, and workers' compensation status.	Level 4, limited-moderate	4	1 (0)	22	15
7B. We cannot recommend for or against advising patients in regard to the following factors related to rotator cuff surgery: diabetes, comorbidities, smoking, infection, and cervical disease.	Inconclusive	0	0 (0)	16	8

(continued)

TABLE 2 (continued)

Recommendation	Level of Evidence	No. of Potential Trials in CT.gov/ ICTRP	No. of Completed Trials in CT.gov/ ICTRP (No. with results)	No. of Relevant Studies From PubMed and EMBASE	No. of Studies From PubMed and EMBASE Directly Addressing Recommendation
8. We suggest that routine acromioplasty is not required at the time of rotator cuff repair.	Level 2, moderate	9	4 (1)	17	6
9. It is an option to perform partial rotator cuff repair, debridement, or muscle transfers for patients with irreparable rotator cuff tears when surgery is indicated.	Level 4, limited	2	0 (0)	26	13
10A. It is an option for surgeons to attempt to achieve tendon to bone healing of the cuff in all patients undergoing rotator cuff repair.	Level 4, limited	5	0 (0)	1	0
10B. We cannot recommend for or against the preferential use of suture anchors vs bone tunnels for repair of full-thickness rotator cuff tears.	Level 4, inconclusive	8	5 (1)	50	0
10C. We cannot recommend for or against a specific technique (arthroscopic, mini-open, or open repair) when surgery is indicated for full-thickness rotator cuff tears.	Level 3, inconclusive	12	5 (3)	81	16
11A. We suggest surgeons not use a non-cross-linked, porcine small intestine submucosal xenograft patch to treat patients with rotator cuff tears.	Level 3, moderate	1	1 (0)	14	9
11B. We cannot recommend for or against the use of soft tissue allografts or other xenografts to treat patients with rotator cuff tears.	Level 4, inconclusive	4	3 (1)	15	6
12. In the absence of reliable evidence, it is the opinion of the work group that local cold therapy is beneficial to relieve pain after rotator cuff surgery.	None, consensus	2	1 (1)	2	1
13A. We cannot recommend for or against the preferential use of an abduction pillow vs a standard sling after rotator cuff repair.	Insufficient, inconclusive	6	2 (1)	7	1
13B. We cannot recommend for or against a specific time frame of shoulder immobilization without range of motion exercises after rotator cuff repair.	Insufficient, inconclusive	18	7 (0)	38	6
13C. We cannot recommend for or against a specific time interval prior to initiation of active resistance exercises after rotator cuff repair.	Insufficient, inconclusive	10	6 (0)	24	4
13D. We cannot recommend for or against home-based exercise programs vs facility-based rehabilitation after rotator cuff surgery.	Level 2, inconclusive	9	5 (0)	15	3
14. We cannot recommend for or against the use of an indwelling subacromial infusion catheter for pain management after rotator cuff repair.	Insufficient, inconclusive	4	3 (1)	5	3

[a]AAOS, American Academy of Orthopaedic Surgeons; CT.gov, ClinicalTrials.gov; ICTRP, International Clinical Trials Registry Platform; NSAIDs, nonsteroidal anti-inflammatory drugs; PEMF, pulsed electromagnetic field; TENS, transcutaneous electrical nerve stimulation.

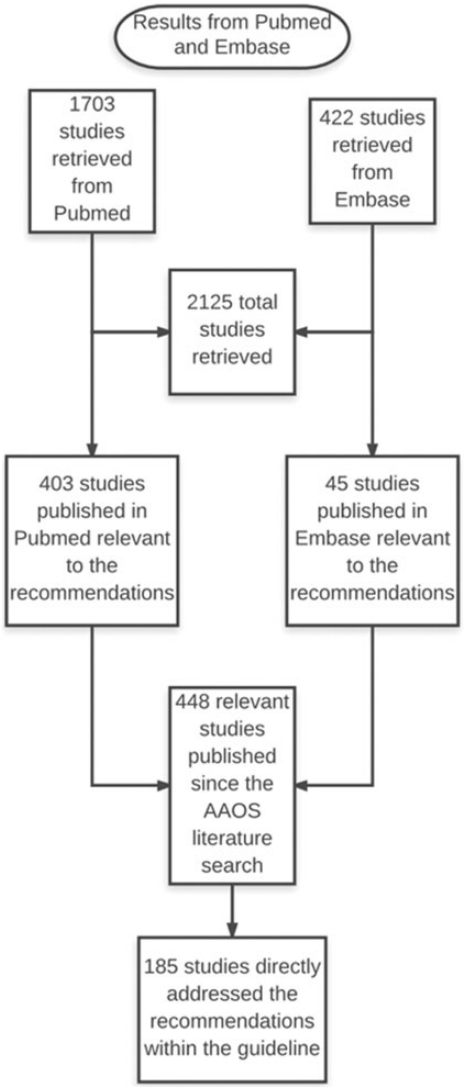

Figure 2. Flow diagram detailing the search results of PubMed and EMBASE. AAOS, American Academy of Orthopaedic Surgeons.

guideline (Appendix Table A4). Collectively, the 185 studies directly addressed 21 (84%) of the 25 guideline recommendations. Of the 25 recommendations, recommendation 2 regarding the use of surgical rotator cuff repair in patients with symptomatic full-thickness tears was found to have the highest number of published studies directly addressing it (n = 33). The recommendations with the next highest number of published studies directly addressing them were 4C (regarding the use of iontophoresis, transcutaneous electrical nerve stimulation, ice, heat, massage, or activity modification for symptomatic non–full-thickness tears), and 4B (regarding subacromial corticosteroid injection or pulsed electromagnetic field in treating symptomatic non–full-thickness tears), which were directly addressed by 24 and 20 published studies, respectively. Recommendations 3C (mechanisms of nonoperative management of rotator cuff tears), 5 (early surgical repair after acute rotator cuff tears), 10A (tendon to bone healing), and 10B (suture anchors vs bone tunnels) were not directly addressed by any published studies.

Of the 185 studies directly addressing the recommendations, the most prevalent study type was randomized trial, accounting for 68 (37%) published studies directly addressing the recommendations; the next most prevalent study type was systematic review/meta-analysis, accounting for 64 (35%) published studies directly addressing the recommendations (Table 3). Of the 25 recommendations, 20 (80%) were directly addressed by at least 1 randomized trial or systematic review/meta-analysis.

Results From OREF

We identified 150 studies funded by OREF from 2012 to 2015. Of these, 20 concerned rotator cuff repair, and 6 addressed research gaps identified from the rotator cuff clinical practice guideline (Table 4). Two funded studies contributed to recommendation 7B (concerning the effects of diabetes, comorbidities, smoking, infection, and cervical disease on rotator cuff repair), and no studies registered in the 2 databases contributed to recommendation 7B. The 4 other grant-funded studies evaluated recommendations 6, 9, 3B, and 7A (Table 4).

DISCUSSION

Rotator cuff injury is the most common injury of the shoulder for which patients seek treatment, and research to improve methods for diagnosis and management should be a high priority. Our results suggest that all recommendations that lacked sufficient evidence at the time of guideline publication are receiving attention from orthopaedic researchers. These efforts suggest that the orthopaedic community is working to address the skepticism regarding "evidence not opinion"[27] after the publication of this controversial "evidence-based" guideline.[19,28] The AAOS standards affirm that clinical practice guidelines should be updated, reviewed, or retired every 5 years.[2] Evidence indicates that waiting more than 3 years to review a guideline may be problematic, as up to 22.2% of recommendations may no longer be valid.[21] No data exist to describe the validity of recommendations, especially those called into question for suspect levels of evidence, despite availability of 9 years of new research data.

Rotator cuff disease is a common and complicated condition. With both surgical and nonsurgical treatments being viable options, a paucity of data are available to support a definitive treatment algorithm for practitioners.[16] In fact, algorithms for diagnosis and management of rotator cuff injuries exist as a matter of expert opinion, animal studies, and observational studies.[20] For most patients, conservative physical therapy and pain management are used; however, if such options fail, surgery is the inevitable option.[15] Although the specific indications for surgery remain unclear, our results show that nearly 220 studies have been performed, or are under way, to investigate techniques for surgical repair of rotator cuff injuries since the 2010 release of

TABLE 3
Classification of Published Studies Directly Addressing the Recommendations in the AAOS Guideline[a]

Recommendation	No. of Randomized Controlled Trials	No. of Systematic Reviews/Meta-Analyses	No. of Review Articles	No. of Case Series	No. of Other Studies
1. In the absence of reliable evidence, it is the opinion of the work group that surgery not be performed for asymptomatic, full-thickness rotator cuff tears.	2	0	0	0	0
2. Rotator cuff repair is an option for patients with chronic, symptomatic full-thickness tears.	3	11	5	6	8
3A. We cannot recommend for or against exercise programs (supervised or unsupervised) for patients with rotator cuff tears.	1	1	0	1	3
3B. We cannot recommend for or against subacromial injections for patients with rotator cuff tears.	2	0	0	0	0
3C. We cannot recommend for or against the use of NSAIDs, activity modification, ice, heat, iontophoresis, massage, TENS, PEMF, or phonophoresis (ultrasound) for nonoperative management of rotator cuff tears.	0	0	0	0	0
4A. We suggest that patients who have rotator cuff–related symptoms in the absence of a full-thickness tear be initially treated nonoperatively using exercise and/or NSAIDs.	6	4	0	0	0
4B. We cannot recommend for or against subacromial corticosteroid injection or PEMF in the treatment of rotator cuff–related symptoms in the absence of a full-thickness tear.	13	7	0	0	0
4C. We cannot recommend for or against the use of iontophoresis, phonophoresis, TENS, ice, heat, massage, or activity modification for patients who have rotator cuff–related symptoms in the absence of a full-thickness tear.	14	8	0	0	2
5. Early surgical repair after acute injury is an option for patients with a rotator cuff tear.	0	0	0	0	0
6. We cannot recommend for or against the use of perioperative subacromial corticosteroid injections or NSAIDs in patients undergoing rotator cuff surgery.	1	0	0	0	0
7A. It is an option for physicians to advise patients that the following factors correlate with less favorable outcomes after rotator cuff surgery: age, atrophy/fatty degeneration, and workers' compensation status.	1	5	3	2	4
7B. We cannot recommend for or against advising patients in regard to the following factors related to rotator cuff surgery: diabetes, comorbidities, smoking, infection, and cervical disease.	0	4	2	0	2
8. We suggest that routine acromioplasty is not required at the time of rotator cuff repair.	3	2	0	0	1
9. It is an option to perform partial rotator cuff repair, debridement, or muscle transfers for patients with irreparable rotator cuff tears when surgery is indicated.	0	5	4	2	2
10A. It is an option for surgeons to attempt to achieve tendon to bone healing of the cuff in all patients undergoing rotator cuff repair.	0	0	0	0	0
10B. We cannot recommend for or against the preferential use of suture anchors vs bone tunnels for repair of full-thickness rotator cuff tears.	0	0	0	0	0
10C. We cannot recommend for or against a specific technique (arthroscopic, mini-open, or open repair) when surgery is indicated for full-thickness rotator cuff tears.	8	5	2	0	1
11A. We suggest surgeons not use a non–cross-linked, porcine small intestine submucosal xenograft patch to treat patients with rotator cuff tears.	1	8	0	0	0
11B. We cannot recommend for or against the use of soft tissue allografts or other xenografts to treat patients with rotator cuff tears.	0	4	0	1	1

(continued)

TABLE 3 (continued)

Recommendation	No. of Randomized Controlled Trials	No. of Systematic Reviews/Meta-Analyses	No. of Review Articles	No. of Case Series	No. of Other Studies
12. In the absence of reliable evidence, it is the opinion of the work group that local cold therapy is beneficial to relieve pain after rotator cuff surgery.	1	0	0	0	0
13A. We cannot recommend for or against the preferential use of an abduction pillow vs a standard sling after rotator cuff repair.	0	0	0	0	1
13B. We cannot recommend for or against a specific time frame of shoulder immobilization without range of motion exercises after rotator cuff repair.	3	2	1	0	0
13C. We cannot recommend for or against a specific time interval prior to initiation of active resistance exercises after rotator cuff repair.	0	2	2	0	0
13D. We cannot recommend for or against home-based exercise programs vs facility-based rehabilitation after rotator cuff surgery.	2	0	0	0	1
14. We cannot recommend for or against the use of an indwelling subacromial infusion catheter for pain management after rotator cuff repair.	3	0	0	0	0

[a]AAOS, American Academy of Orthopaedic Surgeons; NSAIDs, nonsteroidal anti-inflammatory drugs; PEMF, pulsed electromagnetic field; TENS, transcutaneous electrical nerve stimulation.

TABLE 4
Studies Funded by OREF Addressing Recommendations in the Rotator Cuff Clinical Practice Guideline[a]

Study Funded	Year Funded	Recommendation Addressed
Effect of ibuprofen on postoperative narcotic consumption and shoulder functional outcomes after arthroscopic rotator cuff repair	2015	6
Mechanical and structural properties and gene expression patterns in full thickness rotator cuff tears: a study of diabetic versus nondiabetic patients	2014	7B
Effect of nicotine on rotator cuff structure and healing	2013	7B
Biomechanical comparison of the lower trapezius transfer vs latissimus dorsi tendon transfer for irreparable massive posterior-superior rotator cuff tears	2013	9
Platelet-rich plasma vs corticosteroid injection in the treatment of partial thickness rotator cuff tears: a randomized, prospective, double-blinded trial	2013	3B
Satisfaction and shoulder function in patients with re-tear following rotator cuff repair: analysis of the effects of age and activity level	2012	7A

[a]OREF, Orthopaedic Research and Education Foundation.

the AAOS guideline. Our findings also indicate that 185 of these studies directly address the recommendations in the guideline, and of these 185 studies, 132 (71%) are randomized trials or systematic reviews/meta-analyses, which are generally regarded as having a high level of evidence assuming they have robust methods. With 185 new studies directly addressing the recommendations in the guideline and with 80% of the recommendations being directly addressed by at least 1 randomized trial or systematic review/meta-analysis, our findings suggest there may be sufficient research to warrant an evaluation of the recommendations and to determine whether the stances made by the AAOS in the guideline still reflect the evidence base. Doing so may give the AAOS the opportunity to establish a truly evidence-based guideline regarding rotator cuff repair.

Our study suggests that areas not addressed in the AAOS guideline are also receiving much attention by the orthopaedic research community. Interestingly, nearly 70 ongoing or recently published studies have focused on the use of platelet-rich plasma (PRP) injections. While some believe that no definitive evidence supports improved patient outcomes with PRP or stem cell injections, our search results point to an increasing interest in the topic from the orthopaedic community.[1,30] Despite the increased interest, the AAOS guideline contains no definitive statement regarding its stance on this type of therapy. We believe the abundance of new evidence for this less invasive treatment is one of the clearer indications that a guideline update is necessary. With this in mind, we must still consider the potentially prohibitive factors of such a treatment option for our patients. A recent meta-analysis of PRP showed an incremental cost-effectiveness ratio of US$127,893 per quality-adjusted life-year gained.[30] This study suggested not only that this value is prohibitive and noneffective in small and medium-sized tears but that using PRP after large tears is economically and clinically ineffective due to the extent of tissue damage.[30] Safety was not addressed in that meta-analysis, but other studies have made conclusions regarding

the safety of the therapy[26]; however, as stated, cost is a prohibitive factor for the use of PRP.

These conclusions, while interesting, are supported by only 13 studies from 2010 to 2014, and a definitive position on PRP injections by the AAOS may provide guidance and clarity for future research into similar, less invasive treatment options. Furthermore, treatment options for rotator cuff tear such as patch augmentation, superior capsular reconstruction, and reverse total shoulder arthroplasty are not thoroughly addressed by the guideline. An evaluation of the literature and updated recommendations from the AAOS regarding these options may be of value to orthopaedic surgeons and patients alike.

With recognition that repairs leading to retear can negatively affect patient outcome measures, further research into conditions that most commonly lead to retear are of great importance. While some studies indicate that many common comorbid conditions such as osteoporosis (200 million patients worldwide) and diabetes (29.1 million Americans in 2012) have been shown to negatively influence tendon healing,[1,4,31] our study found that there are currently no ongoing trials to address how these factors affect rotator cuff repair or management. Although the number of diseases associated with poor outcomes of rotator cuff repair is high, the research community's commitment to discovering new and improved methods to incorporate this information into treatment and management options is miniscule in comparison with the efforts to improve surgical technique or evaluate the use of PRP or other such injections in nonoperative patients. Although Tashjian et al[29] suggested that patients with an increasing number of medical comorbidities had a greater improvement in postoperative functional outcomes from baseline compared with those without medical comorbidities, the patients with comorbidities began the study with lower preoperative functional status and failed to reach the functional outcomes of those without comorbidities. While this finding is statistically significant for researchers, further studies are needed to illuminate its basis in patient satisfaction and perception of treatment success. The finding also fails to provide a conclusion or resolution to any concerns about treatment selection for those with comorbidities, as all patients were standardized to the same treatment.[29] This confusion provides another opportunity for expert work groups to synthesize the literature and provide evidence-based suggestions for treatment.

Limitations

Our study had limitations. Although we used both ClinicalTrials.gov and the WHO ICTRP, a known comprehensive strategy for searching trial registries,[5] it is possible that our searches did not locate studies that may have been relevant to this investigation. Furthermore, only a small percentage of the registered trials were updated as "complete," and a smaller percentage had uploaded results. This finding could indicate that these studies are not surviving to publication and will not benefit rotator cuff repair evidence or orthopaedic surgery as a whole. While other databases exist, we believe that using PubMed and EMBASE provided an adequate evaluation of the published literature regarding rotator cuff injury; however, using only these databases could have inadvertently excluded relevant studies found in other databases. Although all studies were screened by multiple investigators, there is a chance that studies were incorrectly classified as to whether they addressed the recommendations. Furthermore, while we discovered many studies that directly addressed the recommendations, these studies may have methodological shortcomings that would preclude their inclusion in an AAOS clinical practice guideline, and thus our findings may have overestimated the number of studies that would actually be used as the evidence base for rotator cuff repair recommendations. In addition, because those evaluating grant proposals for the OREF likely distribute funding based on the strength of the proposal, it is possible that the reason rotator cuff recommendations are not being addressed by OREF funding is because proposals that would address these recommendations are not as strong as research focused on other areas of orthopaedics. As such, our findings may have underestimated the interest in addressing rotator cuff repair by those submitting proposals for OREF funding.

CONCLUSION

Our study located 210 newly registered trials and 448 published studies that are relevant to the recommendations made in the AAOS rotator cuff guideline. The majority of the recommendations have been addressed by relevant registered trials or published studies. Of the 448 published studies, 185 directly addressed the guideline recommendations. Additionally, 71% of the 185 published studies directly addressing the recommendations were randomized trials or systematic reviews/meta-analyses.

REFERENCES

1. Abtahi AM, Granger EK, Tashjian RZ. Factors affecting healing after arthroscopic rotator cuff repair. *World J Orthop*. 2015;6(2):211-220.
2. American Academy of Orthopaedic Surgeons (AAOS). AAOS clinical practice guideline and systematic review methodology, v2.0. https://www.aaos.org/uploadedFiles/PreProduction/Quality/Guidelines_and_Reviews/Guideline%20and%20Systematic%20Review%20Processes_v4.0_Final.pdf. Accessed June 9, 2017.
3. American Academy of Orthopaedic Surgeons (AAOS). Optimizing the management of rotator cuff problems. http://www.orthoguidelines.org/topic?id=1007. Published December 4, 2010. Accessed March 23, 2017.
4. American Diabetes Association. Statistics about diabetes. http://www.diabetes.org/diabetes-basics/statistics/. Accessed May 29, 2017.
5. Brasure M, Shamliyan T, Butler M, Kane RL. *Finding Evidence on Ongoing Studies: Discussion*. Rockville, MD: Agency for Healthcare Research and Quality; 2010. https://www.ncbi.nlm.nih.gov/books/NBK52888/. Accessed July 30, 2017.
6. Chalmers I, Glasziou P. Avoidable waste in the production and reporting of research evidence. *Lancet*. 2009;374(9683):86-89.
7. Colvin AC, Egorova N, Harrison AK, Moskowitz A, Flatow EL. National trends in rotator cuff repair. *J Bone Joint Surg Am*. 2012;94(3):227-233.
8. Deprés-Tremblay G, Chevrier A, Snow M, Hurtig MB, Rodeo S, Buschmann MD. Rotator cuff repair: a review of surgical techniques, animal models, and new technologies under development. *J Shoulder Elbow Surg*. 2016;25(12):2078-2085.

9. Dines JS. Editorial commentary: A bridge to nowhere?...Do patches help improve our outcomes after rotator cuff surgery? *Arthroscopy*. 2017;33(3):681-682.
10. Eljabu W, Klinger HM, von Knoch M. The natural history of rotator cuff tears: a systematic review. *Arch Orthop Trauma Surg*. 2015;135(8): 1055-1061.
11. Field LD. Editorial commentary: To move or not to move the shoulder, that is the question. *Arthroscopy*. 2017;33(6):1149-1150.
12. Glanville JM, Duffy S, McCool R, Varley D. Searching ClinicalTrials .gov and the International Clinical Trials Registry Platform to inform systematic reviews: what are the optimal search approaches? *J Med Libr Assoc*. 2014;102(3):177-183.
13. Greenspoon JA, Petri M, Warth RJ, Millett PJ. Massive rotator cuff tears: pathomechanics, current treatment options, and clinical outcomes. *J Shoulder Elbow Surg*. 2015;24(9):1493-1505.
14. Higgins J, Green S, eds. *Cochrane Handbook for Systematic Reviews of Interventions.* Section 5.1.1. London, UK: The Cochrane Collaboration; 2011.
15. Kuhn JE, Dunn WR, Sanders R, et al. Effectiveness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study. *J Shoulder Elbow Surg*. 2013;22(10): 1371-1379.
16. Kweon C, Gagnier JJ, Robbins CB, Bedi A, Carpenter JE, Miller BS. Surgical versus nonsurgical management of rotator cuff tears: predictors of treatment allocation. *Am J Sports Med*. 2015;43(10): 2368-2372.
17. Lambers Heerspink FO, van Raay JJAM, Koorevaar RCT, et al. Comparing surgical repair with conservative treatment for degenerative rotator cuff tears: a randomized controlled trial. *J Shoulder Elbow Surg*. 2015;24(8):1274-1281.
18. Lang TA, Altman DG. Basic statistical reporting for articles published in biomedical journals: the "Statistical Analyses and Methods in the Published Literature" or the SAMPL Guidelines. *Int J Nurs Stud*. 2015; 52(1):5-9.
19. Lubowitz JH, McIntyre LF, Provencher MT, Poehling GG. AAOS rotator cuff clinical practice guideline misses the mark. *Arthroscopy*. 2012;28(5):589-592.
20. Martin SM, Martin TL. Management of rotator cuff tears. UpToDate. https://www.uptodate.com/contents/management-of-rotator-cuff-tears. Accessed May 29, 2017.
21. Martínez García L, Sanabria AJ, García Alvarez E, et al. The validity of recommendations from clinical guidelines: a survival analysis. *CMAJ*. 2014;186(16):1211-1219.
22. Methley AM, Campbell S, Chew-Graham C, McNally R, Cheraghi-Sohi S. PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. *BMC Health Serv Res*. 2014;14:579.
23. Milano G. Editorial commentary: Is lateral acromioplasty effective and safe? *Arthroscopy*. 2016;32(4):576-577.
24. Orthopaedic Research and Education Foundation. Reports & statements. http://www.oref.org/about/annual-report. Accessed May 25, 2017.
25. Palomo JM. The rotator cuff repair mess. *Arthroscopy*. 2013;29(12): 1902.
26. Rha D-W, Park G-Y, Kim Y-K, Kim MT, Lee SC. Comparison of the therapeutic effects of ultrasound-guided platelet-rich plasma injection and dry needling in rotator cuff disease: a randomized controlled trial. *Clin Rehabil*. 2013;27(2):113-122.
27. Sanders JO, Jevsevar DS, Goldberg MJ, Weber KL. Quality guidelines need evidence, not opinion. *J Bone Joint Surg Am*. 2012;94(2):e14.
28. Sanders JO, Jevsevar DS, Goldberg MJ, Weber KL. Quality guidelines need evidence, not opinion: commentary on an article by Robert A. Pedowitz, MD, PhD, et al.: "American Academy of Orthopaedic Surgeons Clinical Practice Guideline on optimizing the management of rotator cuff problems." *J Bone Joint Surg Am*. 2012;94(2):e14.
29. Tashjian RZ, Henn RF, Kang L, Green A. Effect of medical comorbidity on self-assessed pain, function, and general health status after rotator cuff repair. *J Bone Joint Surg Am*. 2006;88(3):536-540.
30. Vavken P, Sadoghi P, Palmer M, et al. Platelet-rich plasma reduces retear rates after arthroscopic repair of small- and medium-sized rotator cuff tears but is not cost-effective. *Am J Sports Med*. 2015; 43(12):3071-3076.
31. World Health Organization. Global health observatory (GHO) data: raised cholesterol. http://www.who.int/gho/ncd/risk_factors/cholesterol_text/en/. Accessed May 29, 2017.

APPENDIX

TABLE A1
List of Search String by Database

Database	Search String
ClinicalTrials.gov	rotator cuff OR shoulder impingement OR supraspinatus tendonitis OR subacromial bursitis OR glenohumeral instability OR cuff tear OR cuff tears OR supraspinatus atrophy OR subacromial atrophy OR ((infraspinatus OR supraspinatus OR subscapularis OR teres minor) AND (tear OR impingement OR augmentation))
ICTRP	rotator cuff OR shoulder impingement OR supraspinatus tendonitis OR subacromial bursitis OR glenohumeral instability OR cuff tear OR cuff tears OR supraspinatus atrophy OR subacromial atrophy OR infraspinatus tear OR infraspinatus impingement OR infraspinatus augmentation OR supraspinatus tear OR supraspinatus impingement OR supraspinatus augmentation OR subscapularis tear OR subscapularis impingement OR subscapularis augmentation OR teres minor tear OR teres minor impingement OR teres minor augmentation
PubMed	rotator cuff OR shoulder impingement OR supraspinatus tendonitis OR subacromial bursitis OR glenohumeral instability OR cuff tear OR cuff tears OR supraspinatus atrophy OR subacromial atrophy OR ((infraspinatus OR supraspinatus OR subscapularis OR teres minor) AND (tear OR impingement OR augmentation)) AND ((Observational Study[ptyp] OR Clinical Trial[ptyp] OR Review[ptyp] OR systematic[sb] OR Meta-analysis[ptyp] OR Multicenter Study[ptyp]) AND ("2008/10/01"[PDat]:"2017/07/24"[PDat]))
EMBASE	'rotator cuff' OR 'shoulder impingement' OR 'supraspinatus tendonitis' OR 'subacromial bursitis' OR 'glenohumeral instability' OR 'cuff tear' OR 'cuff tears' OR 'supraspinatus atrophy' OR 'subacromial atrophy' OR ((infraspinatus OR supraspinatus OR subscapularis OR teres minor) AND (tear OR impingement OR augmentation)) AND ([article]/lim OR [conference paper]/lim OR [review]/lim) AND [english]/lim AND [humans]/lim AND [embase]/lim

TABLE A2
Identified Trials Addressing the Recommendations Made in the AAOS Rotator Cuff Clinical Practice Guideline

Title	Registry No.	Recruitment Status	Recommendation Addressed
Longitudinal study of asymptomatic rotator cuff tears	NCT01085942	Completed	1
Features to predict success with nonoperative treatment of patients with rotator cuff tears	NCT00762580	Active, not recruiting	1
The natural history of asymptomatic rotator cuff tears	NCT00923858	Enrolling by invitation	1
Outcome of arthroscopic repair of chronic rotator cuff tears between 2005-2008	NCT00828256	Unknown status	2
Rotator cuff repair (RCR) with and without OrthoADAPT augmentation	NCT00957255	Withdrawn	2
Arthroscopic surgical outcome study in subjects with rotator cuff tears	NCT00739947	Completed	2
Outcome following surgery to repair rotator cuff tears	NCT00260949	Completed	2
Pilot study of augment rotator cuff for surgical treatment of full thickness rotator cuff tears	NCT01256242	Unknown status	2
Study comparing patient function and satisfaction with arthroscopic subacromial decompression before and after repair of complete rotator cuff tears	NCT01430598	Unknown status	2
Results of shoulder arthroscopic surgery for rotator cuff, biceps tendon, labrum and capsule	NCT01401738	Unknown status	2
Postoperative multiparameter outcomes during the six months after rotator cuff repair	NCT01608997	Unknown status	2
A pilot cohort study of surgical and non-surgical management of rotator cuff tears	NCT03021733	Completed	2
Can shoulder arthroscopy work	NCT01623011	Active, not recruiting	2
Rotator cuff injury to surgery	NCT01744080	Withdrawn	2
Functional and radiographic outcomes after shoulder surgery	NCT01405781	Enrolling by invitation	2
Arthroscopic rotator cuff repair with synovectomy	NCT03061942	Recruiting	2
Comparing the outcomes between rotator cuff repair with and without suprascapular nerve decompression	NCT02107573	Recruiting	2
InSpace™ system over rotator cuff repair in comparison to repair alone	NCT02210910	Active, not recruiting	2
Tenotomy or tenodesis of long head biceps in arthroscopic rotator cuff repair	NCT02655848	Recruiting	2
InSpace™ system in comparison to best repair of massive rotator cuff tear	NCT02208440	Recruiting	2
Impact of humeral component version on outcomes following RTSA	NCT03111147	Recruiting	2
Rotator cuff surgical outcomes in women	NCT02725320	Recruiting	2
Clinical outcomes after arthroscopic tenotomy or tenodesis of the long head of the biceps	NCT02811757	Recruiting	2
Assessing the post-operative quality of recovery and chronic pain rates after elective shoulder surgery	ACTRN12616000878471	Not recruiting	2
Functional reconstruction for irreparable rotator cuff tears	ChiCTR-INR-16008114	Not recruiting	2
Patients with impingement syndrome with and without rotator cuff tears do well 20 years after arthroscopic subacromial decompression	DRKS00006776	Not recruiting	2
Treatment of long head of biceps tendon lesions together with rotator cuff tears: which method is preferred? Tenotomy or tenodesis	IRCT201406117274N10	Not recruiting	2
Comparison between two tenodesis methods in the treatment of biceps tendon and shoulder pathology	IRCT201309247274N9	Not recruiting	2
Tenotomy or tenodesis for long head biceps lesions associated with reparable rotator cuff tears	ChiCTR-TRC-12002649	Recruiting	2
United Kingdom rotator cuff trial	ISRCTN97804283	Not recruiting	2
Outcomes after repair of acute rotator cuff tears	NCT01140230	Completed	5
Clinical and structural outcome after early repair of the traumatic rotator cuff tear	NCT01557309	Completed	5
ACCURATE trial—operative treatment of acute rotator cuff tear related to trauma	NCT02885714	Recruiting	5
Effect of ibuprofen on postoperative opiate medication use and shoulder	NCT02588027	Recruiting	6
The effect of NSAIDs after a rotator cuff repair surgery	NCT02153177	Suspended	6

(continued)

TABLE A2 (continued)

Title	Registry No.	Recruitment Status	Recommendation Addressed
Dexamethasone effect on the duration of interscalenic brachial plexus block guided by ultrasound for videoarthroscopic shoulder surgery	RBR-86mhm2	Not recruiting	6
Radiofrequency microtenotomy for treatment of rotator cuff tendinopathy	NCT02275689	Completed	8
ArthroPlanner: a surgical planning solution for acromioplasty	NCT02725346	Active, not recruiting	8
Latissimus dorsi tendon transfer or partial arthroscopic repair of massive rotator cuff tears	NCT01481480	Recruiting	9
Compression and cold therapy on the post-operative shoulder	NCT00703729	Completed	12
Post-operative pain relief for patients undergoing arthroscopic shoulder surgery—an investigation of the efficacy of cryotherapy	JPRN-UMIN000026796	Not recruiting	12
Post-op rotator cuff pain study with subacromial bupivacaine infusion	NCT01126593	Completed	14
Continuous subacromial bupivacaine	NCT01377415	Completed	14
Post-operative quality of life evaluation for different anesthesia techniques for arthroscopic shoulder surgery	NCT01355757	Completed	14
Use of catheter for patient controlled interscalene analgesia	JPRN-UMIN000025781	Not recruiting	14
Operative versus non-operative management of rotator cuff tear	NCT00695981	Active, not recruiting	1, 2
Comparative effectiveness of operative versus non-operative treatments for rotator cuff tears	NCT02287090	Active, not recruiting	1, 2
Functional and radiological outcome of non-surgical vs surgical treatment for the atraumatic cuff rupture after 1 year (COPACABANA trial)	NTR2343	Recruiting	1, 2
Treatment of atraumatic rotator cuff rupture in elderly patients	NCT01116518	Completed	1, 8, 3A
A comparison of two adjunctive treatments in arthroscopic cuff repair	NCT01706978	Active, not recruiting	10A
Trephination in arthroscopic cuff repair: a prospective randomized controlled trial	NCT01877772	Recruiting	10A
Evaluation of tendon-to-bone healing potential in arthroscopic rotator cuff repair through biological stimulation	NCT03060928	Not yet recruiting	10A
The effect of synovium for tendon-to-bone insertion healing—microvascularity analysis	JPRN-UMIN000017349	Not recruiting	10A
A study in healing process of tendon-to-bone insertion—microvascularity analysis	JPRN-UMIN000017312	Not recruiting	10A
Types of fixation in arthroscopic rotator cuff repair	NCT00508183	Completed	10B
Arthroscopic rotator cuff repair: suture anchors versus arthroscopic transosseous fixation	NCT01815177	Completed	10B
Rotator cuff repair using standard double row technique with platelet rich fibrin membrane vs. standard double row technique	NCT02256891	Completed	10B
Evaluation of the Healicoil suture anchor for rotator cuff repair	NCT02759458	Enrolling by invitation	10B
Suture anchor comparison in rotator cuff repairs	NCT02350647	Recruiting	10B
Optimal insertion angle for suture anchors—an assessment using three dimensional finite element method	JPRN-UMIN000002190	Not recruiting	10B
Comparison of clinical outcomes in all-arthroscopic versus mini-open repair of rotator cuff tears	ChiCTR-IOR-17011244	Not recruiting	10C
Early mobilization following mini-open rotator cuff repair	NCT01741272	Completed	10C, 13A
Outcomes in rotator cuff repair using graft reinforcement	NCT01025037	Completed	11B
Rotator cuff reconstruction with xenologous dermis-patch augmentation and ACPÒ - injection	NCT01586351	Completed	11B
Use of human dehydrated umbilical cord allograft in supraspinatus tendon repair	NCT03084068	Enrolling by invitation	11B
Outcome evaluation of allograft scaffold augmentation for arthroscopic repair of full thickness of rotator cuff tear	KCT0002134	Not recruiting	11B
Duration of immobilization after rotator cuff repair: its clinical impact	NCT00891566	Completed	13A
The role of postoperative immobilization after arthroscopic rotator cuff repair	NCT02050087	Unknown status	13A
Prospective sensor controlled compliance analysis of shoulder abduction splint after rotator cuff repair	NCT03054753	Enrolling by invitation	13A
Early mobilization following arthroscopic rotator cuff repair	NCT01333527	Active, not recruiting	13A

(continued)

TABLE A2 (continued)

Title	Registry No.	Recruitment Status	Recommendation Addressed
Effect of postoperative immobilization on healing after rotator cuff arthroscopic repair	NCT01502098	Unknown status	13A, 13B
Early range of motion following arthroscopic rotator cuff repair	NCT00845715	Completed	13B
Rehabilitation after rotator cuff repair	NCT02261701	Recruiting	13B
Allograft reconstruction of massive rotator cuff tears vs partial repair alone	NCT01987973	Recruiting	13B
Post-operative mobilisation after rotator cuff repair	NCT02943005	Recruiting	13B
Shoulder proprioception following open and arthroscopic instability repair	NCT00889109	Unknown status	13B
Immediate or delayed passive motion for rotator cuff repair	ChiCTR-TRC-12002869	Not recruiting	13B
Is early passive motion exercise necessary after arthroscopic rotator cuff repair?	KCT0000123	Not recruiting	13B
Progressive exercise after operation of rotator cuff rupture and anterior labrum rupture	NCT00624117	Completed	13B, 13C
Post-op rehabilitation's influence on tendon healing & clinical outcomes following arthroscopic rotator cuff repair	NCT00756015	Completed	13B, 13C, 13D
Rehabilitation of reconstructed shoulder rotator cuff	NCT01499992	Completed	13B, 13C, 13D
Effectiveness study of postoperative rotator cuff repair rehabilitation	NCT01819909	Unknown status	13B, 13C, 13D
Early active rehabilitation after arthroscopic rotator cuff repair	NCT02915588	Completed	13B, 13C, 13D
Supra-spinatus rehabilitation program comparison	NCT01467336	Unknown status	13B, 13C, 13D
Enhanced function and quality of life following 5 months of exercise therapy for patients with rotator cuff tears	NCT02740946	Completed	13B, 13C, 13D
Impact of postoperative management on outcomes and healing of rotator cuff repairs	NCT01383239	Completed	13B, 13C, 13D
Progressive active exercise after surgical rotator cuff repair	NCT02969135	Recruiting	13B, 13C, 13D
Accelerated versus conservative rehabilitation following rotator cuff surgery to repair full-thickness tears: clinical outcomes and recovery of muscle function	ACTRN12615000644561	Not recruiting	13B, 13D, 13C
Single versus double row suture anchor repair in medium to large rotator cuff tears	NCT01039571	Completed	2, 10B
Prospective randomized comparative study of outcome of subscapularis tear	NCT01996904	Completed	2, 10B
All-arthroscopic versus mini-open repair of small or moderate rotator cuff tears	NCT00128076	Completed	2, 10C
Arthroscopic rotator cuff repair of full thickness tears with and without arthroscopic acromioplasty	NCT00290888	Completed	2, 8
Rotator cuff repair with arthroscopic acromioplasty (shaving the acromion bone) versus repair without acromioplasty	NCT00664794	Completed	2, 8
The effect of a pre-operative exercise program for patients with full thickness rotator cuff tear waiting for surgical repair	NCT02208752	Unknown status	3A
Anatomic and clinical long-term follow-up of conservatively treated rotator cuff tears	NCT01829633	Enrolling by invitation	3A
Regenexx™ SD versus exercise therapy for rotator cuff tears	NCT01788683	Recruiting	3A
Rehabilitation: closed-chain exercises for rotator cuff tears	NCT02750176	Recruiting	3A
Efficacy of balance training in patients with rotator cuff disease	NCT03054129	Not yet recruiting	3A
Exploring shoulder muscle activity levels during low-intensity exercise in asymptomatic individuals	ACTRN12616000253404	Not recruiting	3A
Preoperative group shoulder program for patients awaiting shoulder surgery	ACTRN12615000764538	Not recruiting	3A
Predicting the outcome of conservative treatment with physiotherapy for shoulder pain in the presence of atraumatic partial-thickness tears of the rotator cuff	DRKS00004462	Not recruiting	3A
A self-managed exercise programme versus usual physiotherapy for chronic rotator cuff disorders	ISRCTN84709751	Not recruiting	3A, 4A
Platelet rich plasma vs. corticosteroid injection in the treatment of partial rotator cuff tears	NCT01688362	Terminated	3B
Ropivacaine block alone or with perineural or systemic dexamethasone for pain in shoulder surgery	NCT01450007	Completed	3B

(continued)

TABLE A2 (continued)

Title	Registry No.	Recruitment Status	Recommendation Addressed
Evaluation of the efficacy and suppression of the hypothalamic-pituitary-adrenal axis resulting in intrabursal single administration of cortisone in patients with calcific tendonitis of the rotator cuff: randomized controlled clinical trial	EUCTR2012-000866-40-IT	Authorized	3B
Ultrasound as a diagnostic tool for rotator cuff tears	NCT01242761	Unknown status	3C
Effectiveness of fascial manipulation in rotator's cuff surgery patients	NCT01888016	Completed	3C
Supervised exercises compared with radial extracorporeal shock wave therapy (rESWT) in patients with SIS	NCT00653081	Unknown status	4A
Progressive resistance training of the biceps in subacromial impingement syndrome	NCT01314196	Completed	4A
Shoulder training: muscle recruitment patterns and the effect of an exercise program	NCT00774956	Completed	4A
Subacromial impingement—the need of arthroscopic subacromial decompression after eccentric physical therapy exercises	NCT01037673	Completed	4A
Effectiveness of physical therapy program to treat rotator cuff disorders among nursing professionals	NCT01465932	Completed	4A
Effect study of an eccentric training program and stretching for patients with chronical rotator cuff tendinopathy	NCT00782522	Completed	4A
Randomized clinical trial of rehabilitation for subacromial impingement syndrome	NCT00633451	Completed	4A
Study of neurocognitive therapeutic exercise in the shoulder impingement syndrome in comparison with traditional therapeutic exercise	NCT01785745	Completed	4A
Supervised exercise therapy vs home exercises for patients with subacromial impingement	NCT01257113	Completed	4A
Exercise in the physiotherapy management of shoulder impingement	NCT01691157	Unknown status	4A
Exercise and manual therapy for shoulder subacromial impingement syndrome	NCT00632996	Completed	4A
Comparison of exercise interventions in adults with subacromial impingement syndrome	NCT01508715	Completed	4A
Effects of a movement training for subacromial pain syndrome	NCT02395770	Completed	4A
Exercise training sequence for subacromial impingement syndrome	NCT02478567	Completed	4A
Eccentric exercises for shoulder pain	NCT02092272	Terminated	4A
The influence of eccentric training on the volume and vascularisation of the rotator cuff in patients with rotator cuff tendinopathy and healthy subjects	NCT01423682	Unknown status	4A
Rotator cuff tendinopathy exercise trial	NCT01984203	Completed	4A
SWESS: the Swedish exercise shoulder study in primary care for patients with subacromial pain	NCT01885377	Completed	4A
Shoulder eccentric external rotator training for subacromial pain syndrome	NCT02153827	Completed	4A
Effect of exercise programs on 3-dimensional scapular kinematics, disability and pain	NCT02286310	Unknown status	4A
The effects of exercise training on shoulder neuromuscular control	NCT02164305	Active, not recruiting	4A
Effectiveness of telerehabilitation program in subacromial syndrome (Telerehab Sis)	NCT02909920	Recruiting	4A
Effects of overload progressive in the treatment of shoulder	NCT02870257	Active, not recruiting	4A
Effectiveness of supervised motor control exercises on rotator cuff tendinopathies	NCT02926443	Recruiting	4A
Effect of muscle coactivation strengthening for rotator cuff tendinopathy	NCT02837848	Recruiting	4A
Effects of isoinertial training on rotator cuff tendinopathy	NCT02982460	Not yet recruiting	4A
Effects of kinesiotaping on symptoms, functional limitations, and underlying deficits of patients with rotator cuff tendinopathy	NCT02881021	Recruiting	4A
The effect of an evidence-based physiotherapy regimen for patients with rotator cuff tendinopathy	NCT02304003	Recruiting	4A
Neurophysiology of weakness and exercise in rotator cuff tendinopathy	NCT02971072	Recruiting	4A
Does early mobilisation improve outcomes after rotator cuff repair?	NCT02631486	Recruiting	4A
Influence of kinetic chain training on the treatment outcome of overhead athletes with impingement	NCT02670174	Active, not recruiting	4A

(continued)

TABLE A2 (continued)

Title	Registry No.	Recruitment Status	Recommendation Addressed
Glenohumeral re-centering during closed kinetic chain for shoulder physiotherapy: a prospective and randomized study	NCT02874105	Not yet recruiting	4A
Strengthening exercises in shoulder impingement (SExSI) trial	NCT02747251	Recruiting	4A
Exercise application in the treatment of patients with shoulder impingement	NCT02695524	Not yet recruiting	4A
Type of exercise and education in patients with subacromial pain syndrome	NCT03127839	Recruiting	4A
Platelet-rich plasma injections and physiotherapy in the treatment of chronic rotator cuff tendinopathy	NCT03133416	Recruiting	4A
Exercises associated or not with manual therapy shoulder impingement	NCT02035618	Completed	4A
Trial to compare the effectiveness of group versus individual therapy on alternate days in patients with subacromial impingement syndrome	NCT02833779	Completed	4A
A pilot randomised controlled trial comparing three different physiotherapy interventions to treat rotator cuff tendinopathy/ subacromial pain syndrome	ACTRN12616001676404	Not recruiting	4A
Efficacy of a motor control program on pain and functionality in patients diagnosed with shoulder impingement syndrome: randomized clinical trial	ACTRN12616001480471	Not recruiting	4A
Comparison of two exercise protocols for the rotator cuff and scapular stabilizers in patients with subacromial syndrome: a randomized controlled pilot study	ACTRN12616000196448	Not recruiting	4A
Specific physiotherapy management for subacromial impingement	ACTRN12615001303538	Not recruiting	4A
Exercise intervention for subacromial impingement syndrome: a randomised controlled trial of two rehabilitation protocols	ACTRN12615000704594	Not recruiting	4A
Pain modulation characteristics in people with shoulder impingement and predictors of successful outcomes following physiotherapy treatment	ACTRN12615000351516	Not recruiting	4A
Nordic-walking as an adjunct to conventional physiotherapie bei shoulder-impingement syndrome	DRKS00005780	Not recruiting	4A
The effect of an eccentric exercise program on patients with shoulder pain and disability which is caused by dysfunction of the rotator cuff	ISRCTN78361279	Not recruiting	4A
A comparison between a traditional exercise program and an eccentric exercise program in patients with anterior shoulder pain	NTR4427	Recruiting	4A
The effects of a therapeutic exercise programme plus or minus manual handling and tape for painful restriction of shoulder movement and function	ACTRN12613000859785	Not recruiting	4A
Use of adhesive strip compared to physiotherapy in treating shoulder pain	RBR-5rt76n	Recruiting	4A
Physiotherapy for shoulder impingement syndrome	ISRCTN86900354	Not recruiting	4A
Effect of physical therapy in patients with shoulder impingement syndrome	ISRCTN20736216	Not recruiting	4A
Exercise therapy for shoulder impingement syndrome	ISRCTN76701121	Not recruiting	4A
Physical therapy versus steroid injection for shoulder impingement syndrome	NCT01190891	Completed	4A, 4B
Exercise therapy and ultrasound guided injections in painful shoulder	NCT01506804	Completed	4A, 4B
Psychomotor therapy as complimentary treatment to patients with shoulder pain	NCT02629783	Recruiting	4A, 4B
Diacutaneous fibrolysis and subacromial syndrome	NCT01424579	Completed	4A, 4C
Noxipoint therapy versus standard physical therapy using electrical stimulation for chronic pain	NCT01578148	Completed	4A, 4C
Teres major muscle and subacromial impingement syndrome	NCT02374125	Unknown status	4A, 4C
Influence of interferential current therapy in the treatment of individuals with shoulder impact syndrome: a randomized, placebo controlled clinical trial	NCT02964819	Completed	4A, 4C
Comparison of two treatments for acute rotator cuff tendinopathy	NCT02813304	Recruiting	4A, 4C
The effects of yoga on patients with rotator cuff injuries	NCT02528084	Completed	4A, 3A
Comparison of 2 doses of corticosteroid subacromial injections for the treatment of painful shoulder	NCT00914836	Withdrawn	4B
Effects of intra-articular versus subacromial steroid injections on clinical outcomes in adhesive capsulitis	NCT00742846	Withdrawn	4B
Pulsed electromagnetic field (PEMF) in impingement shoulder	NCT01452204	Completed	4B
TRARO (Traumeel® S in rotator cuff syndrome)-study	NCT01702233	Completed	4B

(continued)

TABLE A2 (continued)

Title	Registry No.	Recruitment Status	Recommendation Addressed
Ultrasound guided needling versus ultrasound guided corticosteroid injection alone, a randomized controlled trial	NCT01538758	Unknown status	4B
Relationship to dose of triamcinolone acetonide and methylprednisolone to improvement in subacromial bursitis	NCT02242630	Completed	4B
Combined corticosteroid with low volume compared to high volume in impingement syndrome	NCT03120923	Completed	4B
Effect of ultrasound-guided hyaluronic or corticosteroid injections in patients with chronic subacromial bursitis	NCT02702206	Completed	4B
Efficacy and tolerance of ultrasound-guided needling and lavage of calcific tendinitis of the rotator cuff performed with or without subacromial corticosteroid injection	NCT02403856	Recruiting	4B
Standardized and modified corticosteroid subacromial injection for shoulder impingement syndrome	NCT03148353	Not yet recruiting	4B
A dynamic elastic garment (DEG) in patients with rotator cuff tendinopathy	NCT03032432	Not yet recruiting	4B
The pull test to determine responders to subacromial injection in patients with shoulder impingement	NCT02686671	Recruiting	4B
Treatment of calcific tendinitis of the rotator cuff	NCT02419040	Recruiting	4B
Effectiveness of multidirectional compare with single directional approach for subacromial injections in shoulder impingement syndrome	TCTR20170316002	Not recruiting	4B
Comparison between intra-articular injection of corticosteroids and intra-articular injection of hyaluronic acid in the treatment of rotator cuff tendinopathy: a prospective clinical trial	EUCTR2011-003207-37-IT	Authorized	4B
Treatment of chronic rotator cuff tendinopathy with local steroid injection or hyperthermia: a randomized prospective clinical study—ND	EUCTR2008-003952-31-IT	Not recruiting	4B
Defining a randomised controlled study of Ortho-ATI (Trademark) vs corticosteroid injection for treatment of rotator cuff tendinopathy and tear	ACTRN12617000684325	Not recruiting	4B, 3B
Rotator cuff calcific tendonitis: needle us-guided treatment vs. subacromial corticosteroids—a randomized controlled trial	NTR2282	Recruiting	4B, 4C
Extracorporeal shock-wave therapy for supraspinatus calcifying tendonitis: a randomized clinical trial comparing two different energy levels	NCT01602653	Completed	4C
Efficacy and safety of spa treatment in chronic shoulder pain due to rotator cuff tendinopathy	NCT01692249	Completed	4C
Efficacy of electrotherapy in subacromial impingement syndrome	NCT01073956	Unknown status	4C
Ultrasonography guided subacromial sodium hyaluronate injection in rotator cuff disease	NCT01735058	Unknown status	4C
Effectiveness of two electrotherapy techniques to treat subacromial impingement syndrome	NCT02110030	Completed	4C
Low level laser therapy associated with exercise in subacromial impingement syndrome	NCT02725749	Completed	4C
Functional massage of teres major muscle	NCT02374073	Completed	4C
Effects of cryotherapy on joint function and pressure pain threshold in patients with subacromial impingement syndrome	NCT02351986	Completed	4C
Transcranial direct current stimulation to enhance rehabilitation in individuals with rotator cuff tendinopathy	NCT03104218	Recruiting	4C
Subacromial impingement syndrome approach using high intensity laser therapy	NCT02971215	Active, not recruiting	4C
Calcific tendinitis: comparing minimally invasive modalities	NCT02367560	Recruiting	4C
Radial extracorporeal shock wave therapy (rESWT) treatment of subacromial shoulder pain	NCT01441830	Unknown status	4C
An experimental study of low-intensity pulsed ultrasound (LIPUS) treatment for shoulder disorders	JPRN-UMIN000020149	Not recruiting	4C
Treatment of small acute cuff tears, a randomized study	NCT02059473	Recruiting	5, 3A
Long term prognosis of MRI diagnosed partial thickness tears of the rotator cuff	NCT00779415	Completed	7A
Workers compensation board: rotator cuff tear management	NCT01498198	Unknown status	7A

(continued)

TABLE A2 (continued)

Title	Registry No.	Recruitment Status	Recommendation Addressed
A study of quantitative evaluation of muscle atrophy and fatty infiltration of the rotator cuff muscle using magnetic resonance imaging	JPRN-UMIN000018961	Not recruiting	7A
Cost-effectiveness of biceps tenotomy with or without cuff repair in patients with stage 2-3 Goutallier fatty degenerative cuff lesions: a randomized controlled trial	NTR4182	Not recruiting	7A
Operative versus non-operative management of subacromial impingement	NCT00637013	Active, not recruiting	8, 4A
Comparison of tendon repair and physiotherapy in the treatment of small and medium-sized tears of the rotator cuff	NCT00852657	Active, not recruiting	8, 4A
Operative or conservative treatment for subacromial impingement syndrome?	NCT00428870	Active, not recruiting	8, 4A
Intra-operative corticosteroid injection during arthroscopic shoulder surgery	NCT02867904	Not yet recruiting	8, 2, 9
Study evaluating heated lidocaine/tetracaine topical patch in treatment of patients with shoulder impingement syndrome	NCT01055444	Completed	11B
Pilot study to evaluate the restore orthobiologic implant in rotator cuff tear repair	NCT00208338	Completed	11A

TABLE A3
Included Studies From PubMed and EMBASE Addressing the AAOS Recommendations

Recommendation Addressed	Title	Identification
PubMed Results		
2	Surgical treatment of rotator cuff tears after 65 years of age: a systematic review	/pubmed/28555558
2	One-stage surgical treatment for concomitant rotator cuff tears with shoulder stiffness has comparable results with isolated rotator cuff tears: a systematic review	/pubmed/28478897
2	Patient outcomes as a function of shoulder surgeon volume: a systematic review	/pubmed/28456358
2	Predictors of outcomes after rotator cuff repair—a meta-analysis	/pubmed/28237073
2	Difference in vascular patterns between transosseous-equivalent and transosseous rotator cuff repair	/pubmed/27545051
2	Initial treatment of complete rotator cuff tear and transition to surgical treatment: systematic review of the evidence	/pubmed/27331030
2	[Current concepts for treatment of massive rotator cuff tears]	/pubmed/26662370
2	A systematic review and meta-analysis comparing clinical outcomes after concurrent rotator cuff repair and long head biceps tenodesis or tenotomy	/pubmed/26137174
2	Are delayed operations effective for patients with rotator cuff tears and concomitant stiffness? An analysis of immediate versus delayed surgery on outcomes	/pubmed/25306517
2	Is rotator cuff repair appropriate in patients older than 60 years of age? Prospective, randomised trial in 103 patients with a mean four-year follow-up	/pubmed/25155203
2	Repair of full-thickness rotator cuff tears in patients aged younger than 55 years	/pubmed/25064751
2	Rotator cuff repair: published evidence on factors associated with repair integrity and clinical outcome	/pubmed/24753240

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
2	Assessment of rotator cuff repair integrity using ultrasound and magnetic resonance imaging in a multicenter study	/pubmed/24751529
2	Efficacy of surgery for rotator cuff tendinopathy: a systematic review	/pubmed/24682606
2	[Evidence-based treatment of combined rotator cuff and SLAP lesions]	/pubmed/24129723
2	Deep partial rotator cuff tear: transtendon repair or tear completion and repair? A randomized clinical trial	/pubmed/23689964
2	Articular-sided rotator cuff tears: which is the best repair? A three-year prospective randomised controlled trial	/pubmed/23580030
2	General surgical principles of open rotator cuff repair in the management of failed arthroscopic cuff repairs	/pubmed/23395018
2	Transosseous-equivalent rotator cuff repair: a systematic review on the biomechanical importance of tying the medial row	/pubmed/23369482
2	Intraoperative determinants of rotator cuff repair integrity: an analysis of 500 consecutive repairs	/pubmed/23104609
2	Reparable rotator cuff tears with concomitant long-head biceps lesions: tenotomy or tenotomy/tenodesis?	/pubmed/22349543
2	The role of subacromial decompression in patients undergoing arthroscopic repair of full-thickness tears of the rotator cuff: a systematic review and meta-analysis	/pubmed/22305327
2	Repair of partial tears of the rotator cuff	/pubmed/22089290
2	Operative management of partial- and full-thickness rotator cuff tears	/pubmed/21986049
2	Results of surgical management of symptomatic shoulders with partial thickness tears of the rotator cuff	/pubmed/21186203
2	Does the literature confirm superior clinical results in radiographically healed rotator cuffs after rotator cuff repair?	/pubmed/20206051
2	Prospective analysis of arthroscopic rotator cuff repair: subgroup analysis	/pubmed/19269861
5	Acute shoulder injuries in adults	/pubmed/27419328
6	Dexamethasone for pain after outpatient shoulder surgery: a randomised, double-blind, placebo-controlled trial	/pubmed/24825530
8	Does concomitant acromioplasty facilitate arthroscopic repair of full-thickness rotator cuff tears? A meta-analysis with trial sequential analysis of randomized controlled trials	/pubmed/27350920
8	Is acromioplasty necessary in the setting of full-thickness rotator cuff tears? A systematic review	/pubmed/26003837
8	The role of acromioplasty for rotator cuff problems	/pubmed/24684915
8	The efficacy of acromioplasty in the arthroscopic repair of small- to medium-sized rotator cuff tears without acromial spur: prospective comparative study	/pubmed/22261136
8	Arthroscopic subacromial decompression: acromioplasty versus bursectomy alone: does it really matter? A systematic review	/pubmed/22096430
8	Does arthroscopic acromioplasty provide any additional value in the treatment of shoulder impingement syndrome? A two-year randomised controlled trial	/pubmed/19794168
8	Bursectomy compared with acromioplasty in the management of subacromial impingement syndrome: a prospective randomised study	/pubmed/19336812

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
9	Improved external rotation with concomitant reverse total shoulder arthroplasty and latissimus dorsi tendon transfer: a systematic review	/pubmed/28699404
9	Latissimus dorsi transfer in posterior irreparable rotator cuff tears	/pubmed/28400877
9	Arthroscopic repair of articular surface partial-thickness rotator cuff tears: transtendon technique versus repair after completion of the tear—a meta-analysis	/pubmed/27462471
9	[Irreparable rotator cuff tears: debridement, partial reconstruction, tendon transfer or reversed shoulder arthroplasty]	/pubmed/26768144
9	The CSAW Study (Can Shoulder Arthroscopy Work?)—a placebo-controlled surgical intervention trial assessing the clinical and cost effectiveness of arthroscopic subacromial decompression for shoulder pain: study protocol for a randomised controlled trial	/pubmed/25956385
9	Tendon transfer for irreparable rotator cuff tears: indications and surgical rationale	/pubmed/25767779
9	Arthroscopic-assisted latissimus dorsi tendon transfer for irreparable posterosuperior cuff tears	/pubmed/25498458
9	Pectoralis major transfer for treatment of irreparable subscapularis tear: a systematic review	/pubmed/25145944
9	Humeral resurfacing arthroplasty in combination with latissimus dorsi tendon transfer in patients with rotator cuff tear arthropathy and preserved subscapularis muscle function: preliminary report and short-term results	/pubmed/24664451
9	Pectoralis major tendon transfer for irreparable subscapularis tears	/pubmed/24656310
9	Tendon transfers for irreparable rotator cuff tears	/pubmed/23908255
9	[Latissimus dorsi transfer for the treatment of irreparable rotator tears: indication, surgical technique, and modifications]	/pubmed/23104498
9	Latissimus dorsi tendon transfer for irreparable rotator cuff tears: a systematic review	/pubmed/22617916
9	Latissimus dorsi tendon transfer for massive irreparable rotator cuff tears: a systematic review	/pubmed/22089293
9	Massive rotator cuff tears: functional outcome after debridement or arthroscopic partial repair	/pubmed/20198404
9	Modified minimally invasive latissimus dorsi transfer in the treatment of massive rotator cuff tears: a two-year follow-up of 26 consecutive patients	/pubmed/19415274
9	Calcifying tendinitis of the shoulder: advances in imaging and management	/pubmed/19296885
12	Compressive cryotherapy versus ice—a prospective, randomized study on postoperative pain in patients undergoing arthroscopic rotator cuff repair or subacromial decompression	/pubmed/25825138
14	Effect of preemptive intra-articular morphine and ketamine on pain after arthroscopic rotator cuff repair: a prospective, double-blind, randomized controlled study	/pubmed/26476719
14	Administration of analgesics after rotator cuff repair: a prospective clinical trial comparing glenohumeral, subacromial, and a combination of glenohumeral and subacromial injections	/pubmed/25648969
14	Postoperative fentanyl patch versus subacromial bupivacaine infusion in arthroscopic shoulder surgery	/pubmed/23809446

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
14	Efficacy of continuous subacromial bupivacaine infusion for pain control after arthroscopic rotator cuff repair	/pubmed/23668921
14	Pain pump use after shoulder arthroscopy as a cause of glenohumeral chondrolysis	/pubmed/19501296
2, 8	Arthroscopic treatment of rotator cuff tear in the over-60s: repair is preferable to isolated acromioplasty-tenotomy in the short term	/pubmed/21798838
1, 3A	Effectiveness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study	/pubmed/23540577
1, 3A, 2	Clinical and radiological outcome of conservative vs. surgical treatment of atraumatic degenerative rotator cuff rupture: design of a randomized controlled trial	/pubmed/21269421
1, 2, 8, 3A	Treatment of non-traumatic rotator cuff tears: a randomised controlled trial with one-year clinical results	/pubmed/24395315
10A	Augmentation of rotator cuff repair with soft tissue scaffolds	/pubmed/26665095
10B	A biomechanical analysis of anchor placement for Bankart repair: effect of portal placement	/pubmed/26942475
10B	Predicting failures of suture anchors used for rotator cuff repair: a CT-based 3-dimensional finite element analysis	/pubmed/26407199
10B	Does suture technique affect re-rupture in arthroscopic rotator cuff repair? A meta-analysis	/pubmed/25828166
10B	Adverse events associated with biodegradable lactide-containing suture anchors	/pubmed/24650833
10B	Clinical and radiologic results of arthroscopic biceps tenodesis with suture anchor in the setting of rotator cuff tear	/pubmed/24021158
10B	The evolution of suture anchors in arthroscopic rotator cuff repair	/pubmed/23876609
10B	Tissue anchor use in arthroscopic glenohumeral surgery	/pubmed/22751165
10B	Arthroscopic knots and strength sutures for rotator cuff repair	/pubmed/21822109
10B	Proximal humerus osteolysis after revision rotator cuff repair with bioabsorbable suture anchors	/pubmed/21720602
10B	Arthroscopic rotator cuff repair with metal and biodegradable suture anchors: a prospective randomized study	/pubmed/20692119
10B, 2	Arthroscopic knotless-anchor rotator cuff repair: a clinical and radiological evaluation	/pubmed/24792075
10B, 2	Prospective randomized clinical trial of single- versus double-row suture anchor repair in 2- to 4-cm rotator cuff tears: clinical and magnetic resonance imaging results	/pubmed/21444007
10B, 2	Single-row versus double-row arthroscopic rotator cuff repair in small- to medium-sized tears	/pubmed/20303287
10B, 2	Outcomes of single-row and double-row arthroscopic rotator cuff repair: a systematic review	/pubmed/20194334
10B, 2	Single-row versus double-row rotator cuff repair: techniques and outcomes	/pubmed/20118325
10B, 2	Does the literature support double-row suture anchor fixation for arthroscopic rotator cuff repair? A systematic review comparing double-row and single-row suture anchor configuration	/pubmed/19896055

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
10B, 2	Clinical outcomes of double-row versus single-row rotator cuff repairs	/pubmed/19896054
10B, 2	Double-row vs single-row rotator cuff repair: a review of the biomechanical evidence	/pubmed/19833290
10B, 2	A prospective randomized clinical trial comparing arthroscopic single- and double-row rotator cuff repair: magnetic resonance imaging and early clinical evaluation	/pubmed/19204365
10B, 2	Single-row versus double-row arthroscopic rotator cuff repair: a prospective randomized clinical study	/pubmed/19111212
10B, 2	Summary of meta-analyses dealing with single-row versus double-row repair techniques for rotator cuff tears	/pubmed/27708735
10C	The impact of re-tear on the clinical outcome after rotator cuff repair using open or arthroscopic techniques—a systematic review	/pubmed/28400878
10C	Comparison of clinical outcomes in all-arthroscopic versus mini-open repair of rotator cuff tears: a randomized clinical trial	/pubmed/28296750
10C	Radial extracorporeal shock-wave therapy in patients with chronic rotator cuff tendinitis: a prospective randomised double-blind placebo-controlled multicentre trial	/pubmed/24151273
10C, 10B, 2	Which method of rotator cuff repair leads to the highest rate of structural healing? A systematic review	/pubmed/20357403
10C, 10B, 2	Meta-analysis of clinical and radiographic outcomes after arthroscopic single-row versus double-row rotator cuff repair	/pubmed/23016017
10C, 2	[Arthroscopic subacromial decompression]	/pubmed/27259482
10C, 2	Systematic review of all-arthroscopic versus mini-open repair of rotator cuff tears: a meta-analysis	/pubmed/26947557
10C, 2	Clinical effectiveness and cost-effectiveness of open and arthroscopic rotator cuff repair [the UK Rotator Cuff Surgery (UKUFF) randomised trial]	/pubmed/26463717
10C, 2	Systematic review of biceps tenodesis: arthroscopic versus open	/pubmed/26427631
10C, 2	Recovery of subscapularis and shoulder function following arthroscopic treatment of isolated anterior and combined anterosuperior rotator cuff lesions	/pubmed/26388036
10C, 2	Arthroscopic repair for chronic massive rotator cuff tears: a systematic review	/pubmed/26364549
10C, 2	Strength recovery after arthroscopic anterosuperior cuff repair: analysis of a consecutive series	/pubmed/25957552
10C, 2	Clinical and structural outcomes after arthroscopic repair of full-thickness rotator cuff tears with and without platelet-rich product supplementation: a meta-analysis and meta-regression	/pubmed/25450417
10C, 2	Arthroscopic versus mini-open rotator cuff repair: an up-to-date meta-analysis of randomized controlled trials	/pubmed/25442664
10C, 2	Comparison of functional gains after arthroscopic rotator cuff repair in patients over 70 years of age versus patients under 50 years of age: a prospective multicenter study	/pubmed/25442647
10C, 2	Arthroscopic treatment options for irreparable rotator cuff tears of the shoulder	/pubmed/25405083
10C, 2	Long-term outcome after arthroscopic rotator cuff treatment	/pubmed/25145945

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
10C, 2	All-arthroscopic versus mini-open repair of small to large sized rotator cuff tears: a meta-analysis of clinical outcomes	/pubmed/24728326
10C, 2	A randomized clinical trial comparing open and arthroscopic stabilization for recurrent traumatic anterior shoulder instability: two-year follow-up with disease-specific quality-of-life outcomes	/pubmed/24599195
10C, 2	Arthroscopic subscapularis repair	/pubmed/24486754
10C, 2	Results of arthroscopic treatment of rotator cuff tear with the resection of symptomatic acromioclavicular joint with degenerative changes	/pubmed/24231671
10C, 2	Arthroscopic repair of the rotator cuff: prospective study of tendon healing after 70 years of age in 145 patients	/pubmed/24200997
10C, 2	Arthroscopic versus mini-open rotator cuff repair: a prospective, randomized study with 24-month follow-up	/pubmed/23812851
10C, 2	Shoulder arthroscopy: basic principles of positioning, anesthesia, and portal anatomy	/pubmed/23728958
10C, 2	Clinical outcome in all-arthroscopic versus mini-open rotator cuff repair in small to medium-sized tears: a randomized controlled trial in 100 patients with 1-year follow-up	/pubmed/23206691
10C, 2	Arthroscopic repair of subscapularis tears: preliminary data from a prospective multicentre study	/pubmed/23153667
10C, 2	[The isolated subscapularis tendon tear: arthroscopic and open repair]	/pubmed/23104499
10C, 2	Arthroscopic rotator cuff repair: techniques in 2012	/pubmed/23040550
10C, 2	Early postoperative outcomes between arthroscopic and mini-open repair for rotator cuff tears	/pubmed/22955400
10C, 2	Outcomes of arthroscopic and open surgical repair of isolated subscapularis tendon tears	/pubmed/22607828
10C, 2	A comparison of 2 repair techniques for partial-thickness articular-sided rotator cuff tears	/pubmed/22000411
10C, 2	Combined tears of the subscapularis and supraspinatus tendon: clinical outcome, rotator cuff strength and structural integrity following open repair	/pubmed/21990030
10C, 2	Arthroscopic transosseous rotator cuff repair	/pubmed/21986052
10C, 2	Outcomes of arthroscopic versus open rotator cuff repair: a systematic review of the literature	/pubmed/21720577
10C, 2	Prevention and management of stiffness after arthroscopic rotator cuff repair: systematic review and implications for rotator cuff healing	/pubmed/21624680
10C, 2	Long-term follow-up of arthroscopic rotator cuff repair	/pubmed/21620635
10C, 2	Prospective randomised comparison of arthroscopic versus mini-open rotator cuff repair of the supraspinatus tendon	/pubmed/21533643
10C, 2	Multimedia article: The arthroscopic management of partial-thickness rotator cuff tears: a systematic review of the literature	/pubmed/21296545
10C, 2	Trans-tendon arthroscopic repair for partial-thickness articular side tears of the rotator cuff	/pubmed/21229232
10C, 2	[Arthroscopic treatment strategies for the long head of the biceps tendon]	/pubmed/21161169
10C, 2	Rotator cuff integrity after arthroscopic repair for large tears with less-than-optimal footprint coverage	/pubmed/19801287
10C, 2	Evaluating equivalency of treatment effectiveness: the example of arthroscopic and mini-open rotator cuff repairs	/pubmed/19232917

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
10C, 2	Open, mini-open, and all-arthroscopic rotator cuff repair surgery: indications and implications for rehabilitation	/pubmed/19194025
10C, 2	[Arthroscopic versus open anterior shoulder stabilization: a systematic validation]	/pubmed/19093098
10C, 2	Treating full-thickness cuff tears in the athlete: advances in arthroscopic techniques	/pubmed/19064152
10C, 2	New approaches to diagnosis and arthroscopic management of partial-thickness cuff tears	/pubmed/19064151
10C, 2	Rotator cuff tears after 70 years of age: a prospective, randomized, comparative study between decompression and arthroscopic repair in 154 patients	/pubmed/24211128
10C, 2	Massive rotator cuff tears: arthroscopy to arthroplasty	/pubmed/20415384
10C, 2, 10B	Arthroscopic rotator cuff repair: suture anchor properties, modes of failure and technical considerations	/pubmed/21542709
10C, 2, 13B	Early mobilisation following mini-open rotator cuff repair: a randomised control trial	/pubmed/26330594
10C, 2, 13B	Prospective randomized study of arthroscopic rotator cuff repair using an early versus delayed postoperative physical therapy protocol	/pubmed/22554876
10C, 8	Arthroscopic versus open acromioplasty: a meta-analysis	/pubmed/19188562
10C, 8, 2	Arthroscopic repair of full-thickness rotator cuff tears with and without acromioplasty: randomized prospective trial with 2-year follow-up	/pubmed/24733157
10C, 2	Complications following arthroscopic rotator cuff tear repair: a systematic review of terms and definitions with focus on shoulder stiffness	/pubmed/26665096
11A	A randomized clinical trial to compare the effectiveness of rotator cuff repair with or without augmentation using porcine small intestine submucosa for patients with moderate to large rotator cuff tears: a pilot study	/pubmed/27545050
11A	[Patch augmentation of the rotator cuff: a reasonable choice or a waste of money?]	/pubmed/26754656
11A	Synthetic and degradable patches: an emerging solution for rotator cuff repair	/pubmed/23837794
11A, 11B	Graft utilization in the bridging reconstruction of irreparable rotator cuff tears: a systematic review	/pubmed/28345960
11A, 11B	Can grafts provide superior tendon healing and clinical outcomes after rotator cuff repairs? A meta-analysis	/pubmed/28203585
11A, 11B	Graft augmentation versus bridging for large to massive rotator cuff tears: a systematic review	/pubmed/27956233
11A, 11B	Use of grafts in rotator cuff re-rupture	/pubmed/27453346
11A, 11B	Outcomes after patch use in rotator cuff repair	/pubmed/27157657
11A, 11B	A prospective, multicenter study to evaluate clinical and radiographic outcomes in primary rotator cuff repair reinforced with a xenograft dermal matrix	/pubmed/27130784
11A, 11B	Graft utilization in the augmentation of large-to-massive rotator cuff repairs: a systematic review	/pubmed/26847487
11B	Acellular dermal matrix in rotator cuff surgery	/pubmed/27552454
11B	Orthopedic applications of acellular human dermal allograft for shoulder and elbow surgery	/pubmed/26043051
11B	Early versus delayed passive range of motion after rotator cuff repair: a systematic review and meta-analysis	/pubmed/25296646
11B	Orthopedic interface tissue engineering for the biological fixation of soft tissue grafts	/pubmed/19064172

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
11B, 11C	Effects of slow and accelerated rehabilitation protocols on range of motion after arthroscopic rotator cuff repair	/pubmed/25637728
13A	Does a brace influence clinical outcomes after arthroscopic rotator cuff repair?	/pubmed/25957544
13A	Does early versus delayed active range of motion affect rotator cuff healing after surgical repair? A systematic review and meta-analysis	/pubmed/25943112
13A	Early versus delayed rehabilitation following arthroscopic rotator cuff repair: a systematic review	/pubmed/25797067
13A, 13B, 13C	Rehabilitation following rotator cuff repair: a systematic review	/pubmed/27582966
13A, 13B, 13C	Knowing the speed limit: weighing the benefits and risks of rehabilitation progression after arthroscopic rotator cuff repair	/pubmed/25818711
13B	Does early motion lead to a higher failure rate or better outcomes after arthroscopic rotator cuff repair? A systematic review of overlapping meta-analyses	/pubmed/28619382
13B	Early versus delayed motion after rotator cuff repair	/pubmed/28288280
13B	Immobilization after rotator cuff repair: what evidence do we have now?	/pubmed/26614931
13B	Passive mobilization after arthroscopic rotator cuff repair is not detrimental in the early postoperative period	/pubmed/26435245
13B	Rehabilitation protocol after arthroscopic rotator cuff repair: early versus delayed motion	/pubmed/26309485
13B	Early versus delayed passive range of motion exercise for arthroscopic rotator cuff repair: a meta-analysis of randomized controlled trials	/pubmed/25143489
13B	Delayed versus early motion after arthroscopic rotator cuff repair: a meta-analysis	/pubmed/25127908
13B	Does immobilization after arthroscopic rotator cuff repair increase tendon healing? A systematic review and meta-analysis	/pubmed/25027677
13B	Early passive motion versus immobilization after arthroscopic rotator cuff repair	/pubmed/24813324
13B	Effect of immobilization without passive exercise after rotator cuff repair: randomized clinical trial comparing four and eight weeks of immobilization	/pubmed/24647511
13B	Immediate passive motion versus immobilization after endoscopic supraspinatus tendon repair: a prospective randomized study	/pubmed/22944392
13B	Is early passive motion exercise necessary after arthroscopic rotator cuff repair?	/pubmed/22287641
13B	The effectiveness of continuous passive motion on range of motion, pain and muscle strength following rotator cuff repair: a systematic review	/pubmed/20943710
13B, 13C	Rehabilitation after rotator cuff repair	/pubmed/28400883
13B, 13C	Effectiveness of early compared with conservative rehabilitation for patients having rotator cuff repair surgery: an overview of systematic reviews	/pubmed/28039127
13B, 13C	Effectiveness of standardized physical therapy exercises for patients with difficulty returning to usual activities after decompression surgery for subacromial impingement syndrome: randomized controlled trial	/pubmed/26916927
13B, 13C	Efficacy of informed versus uninformed physiotherapy on postoperative retear rates of medium-sized and large rotator cuff tears	/pubmed/26190666

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
13B, 13C	Effects of one-month continuous passive motion after arthroscopic rotator cuff repair: results at 1-year follow-up of a prospective randomized study	/pubmed/20383685
13B, 13C	Early loading in physiotherapy treatment after full-thickness rotator cuff repair: a prospective randomized pilot-study with a two-year follow-up	/pubmed/19482895
13B, 13C	Are pulley exercises initiated 6 weeks after rotator cuff repair a safe and effective rehabilitative treatment? A randomized controlled trial	/pubmed/27159310
13B, 13C, 13D	Rehabilitation following surgical repair of the rotator cuff: a systematic review	/pubmed/26510584
13B, 13C, 13D	A comparison of rehabilitation methods after arthroscopic rotator cuff repair: a systematic review	/pubmed/26137178
13B, 13C, 13D	Rehabilitation following rotator cuff repair: a survey of current UK practice	/pubmed/27582979
13B, 13C, 13D	Does adding a 12-month exercise programme to usual care after a rotator cuff repair effect disability and quality of life at 12 months? A randomized controlled trial	/pubmed/25172089
13B, 13C, 13D	Rehabilitation following arthroscopic rotator cuff repair: a review of current literature	/pubmed/24382874
13B, 13C, 13D	Rehabilitation following arthroscopic rotator cuff repair: a prospective randomized trial of immobilization compared with early motion	/pubmed/24382719
13B, 13C, 13D	[Comparison of the results of supervised physiotherapy program and home-based exercise program in patients treated with arthroscopic-assisted mini-open rotator cuff repair]	/pubmed/22085347
13B, 13C, 13D	Effect of two rehabilitation protocols on range of motion and healing rates after arthroscopic rotator cuff repair: aggressive versus limited early passive exercises	/pubmed/22014477
13B, 13C, 13D	Comparison of slow and accelerated rehabilitation protocol after arthroscopic rotator cuff repair: pain and functional activity	/pubmed/21478659
13B, 13C, 13D	Rehabilitation following arthroscopic rotator cuff repair	/pubmed/20226314
13B, 13C, 13D	Post-operative rehabilitation after surgical repair of the rotator cuff	/pubmed/19711171
13B, 13C, 13D	Rotator cuff repair rehabilitation: a level I and II systematic review	/pubmed/23015863
13B, 13C, 13D	Supervised versus uncontrolled rehabilitation of patients after rotator cuff repair—clinical and neurophysiological comparative study	/pubmed/22287203
13C, 13D	Supervised strengthening exercises versus home-based movement exercises after arthroscopic acromioplasty: a randomized clinical trial	/pubmed/22124602
2, 10B	Double-row repair lowers the retear risk after accelerated rehabilitation	/pubmed/26797698
2, 10B	[Rotator cuff repair: single- vs double-row: clinical and biomechanical results]	/pubmed/26694067
2, 10B	[Open double-row rotator cuff repair using the LASA-DR screw]	/pubmed/25900829
2, 10B	Incidence of retear with double-row versus single-row rotator cuff repair	/pubmed/25361362
2, 10B	Is double-row rotator cuff repair clinically superior to single-row rotator cuff repair: a systematic review of overlapping meta-analyses	/pubmed/24821226

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
2, 10B	Clinical and structural outcomes after arthroscopic single-row versus double-row rotator cuff repair: a systematic review and meta-analysis of level I randomized clinical trials	/pubmed/24411671
2, 10B	Meta-analysis comparing single-row and double-row repair techniques in the arthroscopic treatment of rotator cuff tears	/pubmed/24183478
2, 10B	Ultrasound evaluation of arthroscopic full-thickness supraspinatus rotator cuff repair: single-row versus double-row suture bridge (transosseous equivalent) fixation: results of a prospective, randomized study	/pubmed/24012360
2, 10B	Single-row or double-row fixation technique for full-thickness rotator cuff tears: a meta-analysis	/pubmed/23874649
2, 10B	Outcomes of single-row versus double-row arthroscopic rotator cuff repair: a systematic review and meta-analysis of current evidence	/pubmed/23711754
2, 10B	Arthroscopic single-row versus double-row rotator cuff repair: a meta-analysis of the randomized clinical trials	/pubmed/23369480
2, 10B	A multicenter randomized controlled trial comparing single-row with double-row fixation in arthroscopic rotator cuff repair	/pubmed/22810395
2, 10B	Single-row versus double-row arthroscopic repair in the treatment of rotator cuff tears: a prospective randomized clinical study	/pubmed/22584619
2, 10B	Does double-row rotator cuff repair improve functional outcome of patients compared with single-row technique? A systematic review	/pubmed/22156169
2, 10B	Double row repair: is it worth the hassle?	/pubmed/22089283
2, 10B	Repair integrity and functional outcome after arthroscopic rotator cuff repair: double-row versus suture-bridge technique	/pubmed/22074913
2, 10B	Single- and double-row repair for rotator cuff tears—biology and mechanics	/pubmed/21986051
2, 10B	Clinical outcome and imaging of arthroscopic single-row and double-row rotator cuff repair: a prospective randomized trial	/pubmed/21982391
2, 10B	A systematic review of the clinical outcomes of single row versus double row rotator cuff repairs	/pubmed/21281917
2, 10B	Medial versus lateral supraspinatus tendon properties: implications for double-row rotator cuff repair	/pubmed/20929937
2, 10B	Single versus double-row repair of the rotator cuff: does double-row repair with improved anatomical and biomechanical characteristics lead to better clinical outcome?	/pubmed/20737134
2, 10B	Bridging self-reinforcing double-row rotator cuff repair: we really are doing better	/pubmed/20434667
2, 10B	Single-row repair versus double-row repair of full-thickness rotator cuff tears	/pubmed/21693349
2, 10C	Arthroscopic repair of isolated subscapularis tears: a systematic review of technique-specific outcomes	/pubmed/28082063
2, 10C	Effectiveness of open and arthroscopic rotator cuff repair (UKUFF): a randomised controlled trial	/pubmed/28053265
2, 10C	Costs, quality of life and cost-effectiveness of arthroscopic and open repair for rotator cuff tears: an economic evaluation alongside the UKUFF trial	/pubmed/27909127
2, 10C	Complications associated with arthroscopic rotator cuff tear repair: definition of a core event set by Delphi consensus process	/pubmed/27496354

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
2, 10C	The etiology and arthroscopic surgical management of cam lesions	/pubmed/27343392
2, 10C, 10B	The clinical effect of a rotator cuff retear: a meta-analysis of arthroscopic single-row and double-row repairs	/pubmed/27416991
2, 10C, 10B	Retear rates after arthroscopic single-row, double-row, and suture bridge rotator cuff repair at a minimum of 1 year of imaging follow-up: a systematic review	/pubmed/26188783
2, 10C, 10B	Arthroscopic single-row versus double-row technique for repairing rotator cuff tears: a systematic review and meta-analysis	/pubmed/25430714
2, 10C, 8, 13B	Efficacy of different rotator cuff repair techniques	/pubmed/26055023
2, 11A, 11B	Outcome of large to massive rotator cuff tears repaired with and without extracellular matrix augmentation: a prospective comparative study	/pubmed/25891222
2, 3A	Surgery or conservative treatment for rotator cuff tear: a meta-analysis	/pubmed/27385156
2, 3A	Tendon repair compared with physiotherapy in the treatment of rotator cuff tears: a randomized controlled study in 103 cases with a five-year follow-up	/pubmed/25232074
2, 3A	Comparison between surgery and physiotherapy in the treatment of small and medium-sized tears of the rotator cuff: a randomised controlled study of 103 patients with one-year follow-up	/pubmed/20044684
2, 3A	Comparing surgical repair with conservative treatment for degenerative rotator cuff tears: a randomized controlled trial	/pubmed/26189808
2, 8, 10C	Arthroscopic rotator cuff repair with and without acromioplasty in the treatment of full-thickness rotator cuff tears: a multicenter, randomized controlled trial	/pubmed/22048089
3A	PEDro systematic review update: the effectiveness of physiotherapy exercises in subacromial impingement syndrome	/pubmed/23881891
3A	A prospective randomized controlled trial comparing occupational therapy with home-based exercises in conservative treatment of rotator cuff tears	/pubmed/23523073
3A, 12, 13C, 13D	A systematic review of cost-effective treatment of postoperative rotator cuff repairs	/pubmed/28314695
3A, 3C, 4A, 4B	Effectiveness of conservative interventions including exercise, manual therapy and medical management in adults with shoulder impingement: a systematic review and meta-analysis of RCTs	/pubmed/28630217
3A, 3C, 4A, 4B, 4C	Manual therapy and exercise for rotator cuff disease	/pubmed/27283590
3A, 3C, 4A, 4C	Systematic review of nondrug, nonsurgical treatment of shoulder conditions	/pubmed/28554433
3A, 4A	Prognostic models in adults undergoing physical therapy for rotator cuff disorders: systematic review	/pubmed/26637648
3A, 4A	Self-managed loaded exercise versus usual physiotherapy treatment for rotator cuff tendinopathy: a pilot randomised controlled trial	/pubmed/23954024
3A, 4A	A mixed methods study to evaluate the clinical and cost-effectiveness of a self-managed exercise programme versus usual physiotherapy for chronic rotator cuff disorders: protocol for the SELF study	/pubmed/22545990
3A, 4A	Exercise for rotator cuff tendinopathy: a systematic review	/pubmed/22507359

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
3A, 4A	Early activation or a more protective regime after arthroscopic subacromial decompression: a description of clinical changes with two different physiotherapy treatment protocols: a prospective, randomized pilot study with a two-year follow-up	/pubmed/18955427
3A, 8, 2	Treatment of nontraumatic rotator cuff tears: a randomized controlled trial with two years of clinical and imaging follow-up	/pubmed/26537160
3A, 3B, 3C	Nonsurgical treatment for rotator cuff injury in the elderly	/pubmed/18992694
4B	Ultrasound-guided versus blind subacromial-subdeltoid bursa injection in adults with shoulder pain: a systematic review and meta-analysis	/pubmed/26590864
4B	Comparison of efficacy of kinesiological taping and subacromial injection therapy in subacromial impingement syndrome	/pubmed/25403253
3B	Corticosteroids injection in rotator cuff tears in elderly patient: pain outcome prediction	/pubmed/24131759
3B	Injection of the subacromial bursa in patients with rotator cuff syndrome: a prospective, randomized study comparing the effectiveness of different routes	/pubmed/22992814
3B	Effects of corticosteroids injection in rotator cuff tears	/pubmed/21951654
4B	Ultrasound-guided versus blind subacromial corticosteroid injections for subacromial impingement syndrome: a randomized, double-blind clinical trial	/pubmed/26717970
3B, 4B	Intra-articular and soft tissue injections, a systematic review of relative efficacy of various corticosteroids	/pubmed/24651914
3B, 4B	Imaging-guided subacromial therapeutic injections: prospective study comparing abnormalities on conventional radiography with patient outcomes	/pubmed/24059377
4B	Calcific tendinitis of the rotator cuff: a randomized controlled trial of ultrasound-guided needling and lavage versus subacromial corticosteroids	/pubmed/23696211
3B, 4B	Subacromial ultrasound guided or systemic steroid injection for rotator cuff disease: randomised double blind study	/pubmed/19168537
3C	Tendonitis of the rotator cuff treated with extracorporeal shock wave therapy: radiographic monitoring to identify prognostic factors for disintegration	/pubmed/28078874
3C, 4C	Ultrasound-guided interventional procedures about the shoulder: anatomy, indications, and techniques	/pubmed/27468666
3C, 4C	Efficacy of transcutaneous electrical nerve stimulation for rotator cuff tendinopathy: a systematic review	/pubmed/26619821
3C, 4C	Intense focused ultrasound stimulation of the rotator cuff: evaluation of the source of pain in rotator cuff tears and tendinopathy	/pubmed/26058842
3C, 4C	[Functional results of type A botulinum toxin versus oral anti-inflammatory agents in the rehabilitation of painful shoulder syndrome caused by rotator cuff lesion]	/pubmed/26021089
3C, 4C	The efficacy of therapeutic ultrasound for rotator cuff tendinopathy: a systematic review and meta-analysis	/pubmed/25824429
3C, 4C	A systematic review of shockwave therapies in soft tissue conditions: focusing on the evidence	/pubmed/23918444
4A	Specific or general exercise strategy for subacromial impingement syndrome—does it matter? A systematic literature review and meta analysis	/pubmed/28416022

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
4A	Efficacy of exercise therapy in workers with rotator cuff tendinopathy: a systematic review	/pubmed/27488037
4A	Effects of stretching and strengthening exercises, with and without manual therapy, on scapular kinematics, function, and pain in individuals with shoulder impingement: a randomized controlled trial	/pubmed/26471852
4A	Effectiveness of the eccentric exercise therapy in physically active adults with symptomatic shoulder impingement or lateral epicondylar tendinopathy: a systematic review	/pubmed/26304796
4A	A self-managed single exercise programme versus usual physiotherapy treatment for rotator cuff tendinopathy: a randomised controlled trial (the SELF study)	/pubmed/26160149
4A	Efficacy of proprioceptive exercises in patients with subacromial impingement syndrome: a single-blinded randomized controlled study	/pubmed/26098920
4A	Home exercises and supervised exercises are similarly effective for people with subacromial impingement: a randomised trial	/pubmed/26093810
4A	Evaluation of the effectiveness of three physiotherapeutic treatments for subacromial impingement syndrome: a randomised clinical trial	/pubmed/26051846
4A	[Eccentric strength training for the rotator cuff tendinopathies with subacromial impingement: current evidence]	/pubmed/25982614
4A	Is exercise effective for the management of subacromial impingement syndrome and other soft tissue injuries of the shoulder? A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration	/pubmed/25920340
4A	Short-term effectiveness of precut kinesiology tape versus an NSAID as adjuvant treatment to exercise for subacromial impingement: a randomized controlled trial	/pubmed/25915145
4A	Therapeutic exercise for rotator cuff tendinopathy: a systematic review of contextual factors and prescription parameters	/pubmed/25715230
4A	Progressive high-load strength training compared with general low-load exercises in patients with rotator cuff tendinopathy: study protocol for a randomised controlled trial	/pubmed/25622594
4A	Eccentric training as a new approach for rotator cuff tendinopathy: review and perspectives	/pubmed/25405092
4A	The impact of adding an eccentric-exercise component to the rehabilitation program of patients with shoulder impingement: a critically appraised topic	/pubmed/25364914
4A	Effectiveness of physiotherapy and costs in patients with clinical signs of shoulder impingement syndrome: one-year follow-up of a randomized controlled trial	/pubmed/25211291
4A	The clinical and sonographic effects of kinesiotaping and exercise in comparison with manual therapy and exercise for patients with subacromial impingement syndrome: a preliminary trial	/pubmed/25108752
4A	Physiotherapy assessment of patients with rotator cuff pathology	/pubmed/27582940
4A	A specific exercise strategy reduced the need for surgery in subacromial pain patients	/pubmed/24970843

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
4A	Conservative treatment or surgery for shoulder impingement: systematic review and meta-analysis	/pubmed/24694286
4A	Optimal management of shoulder impingement syndrome	/pubmed/24648778
4A	The efficacy of oral non-steroidal anti-inflammatory drugs for rotator cuff tendinopathy: a systematic review and meta-analysis	/pubmed/24626286
4A	Effect of isokinetic training on shoulder impingement	/pubmed/24615039
4A	The therapeutic role of motor imagery on the functional rehabilitation of a stage II shoulder impingement syndrome	/pubmed/24575717
4A	Neurocognitive therapeutic exercise improves pain and function in patients with shoulder impingement syndrome: a single-blind randomized controlled clinical trial	/pubmed/24429918
4A	Subacromial impingement syndrome: effectiveness of physiotherapy and manual therapy	/pubmed/24217037
4A	Does kinesio taping in addition to exercise therapy improve the outcomes in subacromial impingement syndrome? A randomized, double-blind, controlled clinical trial	/pubmed/23619543
4A	Physiotherapy in patients with clinical signs of shoulder impingement syndrome: a randomized controlled trial	/pubmed/23584840
4A	Mobilization with movement and kinesiotaping compared with a supervised exercise program for painful shoulder: results of a clinical trial	/pubmed/22921332
4A	The effectiveness of physiotherapy exercises in subacromial impingement syndrome: a systematic review and meta-analysis	/pubmed/22607807
4A	Does adding heavy load eccentric training to rehabilitation of patients with unilateral subacromial impingement result in better outcome? A randomized, clinical trial	/pubmed/22581193
4A	Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomised controlled study	/pubmed/22349588
4A	Conservative treatment and rotator cuff tear progression	/pubmed/21986048
4A	The effectiveness of scapular stabilization exercise in the patients with subacromial impingement syndrome	/pubmed/21849731
4A	[May eccentric training be effective in the conservative treatment of chronic supraspinatus tendinopathies? A review of the current literature]	/pubmed/21157654
4A	High-dosage medical exercise therapy in patients with long-term subacromial shoulder pain: a randomized controlled trial	/pubmed/21110409
4A	Comprehensive impairment-based exercise and manual therapy intervention for patients with subacromial impingement syndrome: a case series	/pubmed/20710088
4A	Effectiveness of individualized physiotherapy on pain and functioning compared to a standard exercise protocol in patients presenting with clinical signs of subacromial impingement syndrome: a randomized controlled trial	/pubmed/20534140
4A	Efficacy of standardised manual therapy and home exercise programme for chronic rotator cuff disease: randomised placebo controlled trial	/pubmed/20530557

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
4A	[Comparison of the effects of two different exercise programs on pain in subacromial impingement syndrome]	/pubmed/20134218
4A	Clinical outcomes of exercise in the management of subacromial impingement syndrome: a systematic review	/pubmed/20103573
4A	Effects of physiotherapy in patients with shoulder impingement syndrome: a systematic review of the literature	/pubmed/19841837
4A	Progressive resistance training in patients with shoulder impingement syndrome: literature review	/pubmed/19633794
4A	Exercise in the treatment of rotator cuff impingement: a systematic review and a synthesized evidence-based rehabilitation protocol	/pubmed/18835532
4A, 3A	Rehabilitation of shoulder impingement syndrome and rotator cuff injuries: an evidence-based review	/pubmed/20371557
4A, 4B	One-year outcome of subacromial corticosteroid injection compared with manual physical therapy for the management of the unilateral shoulder impingement syndrome: a pragmatic randomized trial	/pubmed/25089860
4A, 4B	Subacromial impingement syndrome and pain: protocol for a randomised controlled trial of exercise and corticosteroid injection (the SUPPORT trial)	/pubmed/24625273
4A, 4B	Pulsed electromagnetic field and exercises in patients with shoulder impingement syndrome: a randomized, double-blind, placebo-controlled clinical trial	/pubmed/24139986
4A, 4B	Cost-effectiveness of exercise therapy after corticosteroid injection for moderate to severe shoulder pain due to subacromial impingement syndrome: a trial-based analysis	/pubmed/23630367
4A, 4B	Subacromial impingement syndrome: effectiveness of pharmaceutical interventions—nonsteroidal anti-inflammatory drugs, corticosteroid, or other injections: a systematic review	/pubmed/23246416
4A, 4B	A double-blind randomized controlled trial comparing the effects of subacromial injection with corticosteroid versus NSAID in patients with shoulder impingement syndrome	/pubmed/23177167
4A, 4B	Subacromial corticosteroid injection or acupuncture with home exercises when treating patients with subacromial impingement in primary care: a randomized clinical trial	/pubmed/21378086
4A, 4B	Exercise therapy after corticosteroid injection for moderate to severe shoulder pain: large pragmatic randomised trial	/pubmed/20584793
4A, 4B, 4C, 9	Treatments for shoulder impingement syndrome: a PRISMA systematic review and network meta-analysis	/pubmed/25761173
4A, 4C	Is extracorporeal shockwave therapy combined with isokinetic exercise more effective than extracorporeal shockwave therapy alone for subacromial impingement syndrome? A randomized clinical trial	/pubmed/27477254
4A, 4C	Effects of low-level laser therapy in combination with physiotherapy in the management of rotator cuff tendinitis	/pubmed/22052627
4A, 4C	Are ultrasound, laser and exercise superior to each other in the treatment of subacromial impingement syndrome? A randomized clinical trial	/pubmed/21946399

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
4A, 4C	Additive effects of low-level laser therapy with exercise on subacromial syndrome: a randomised, double-blind, controlled trial	/pubmed/21538218
4A, 4C	Supervised exercises compared with radial extracorporeal shock-wave therapy for subacromial shoulder pain: 1-year results of a single-blind randomized controlled trial	/pubmed/21088117
4A, 4C	Radial extracorporeal shockwave treatment compared with supervised exercises in patients with subacromial pain syndrome: single blind randomised study	/pubmed/19755551
4A, 8	Which patients do not recover from shoulder impingement syndrome, either with operative treatment or with nonoperative treatment?	/pubmed/25809315
4A, 8	Comparison of open acromioplasty, arthroscopic acromioplasty and physiotherapy in patients with subacromial impingement syndrome: a prospective randomised study	/pubmed/25385527
4B	Injectable corticosteroids: take precautions and use caution	/pubmed/28002861
4B	Efficacy of triamcinolone acetate and methylprednisolone acetonide for intrabursal injection after ultrasound-guided percutaneous treatment in painful shoulder calcific tendonitis: a randomized controlled trial	/pubmed/27856801
4B	The comparative efficacy of kinesio taping and local injection therapy in patients with subacromial impingement syndrome	/pubmed/27670388
4B	CORR Insights(®): corticosteroid injections give small and transient pain relief in rotator cuff tendinosis: a meta-analysis	/pubmed/27572298
3B	Subacromial injection of autologous platelet-rich plasma versus corticosteroid for the treatment of symptomatic partial rotator cuff tears	/pubmed/27544678
4B	Corticosteroid injections give small and transient pain relief in rotator cuff tendinosis: a meta-analysis	/pubmed/27469590
3B	The effect of subacromial injections of autologous conditioned plasma versus cortisone for the treatment of symptomatic partial rotator cuff tears	/pubmed/26017742
4B	Comparison of subacromial tenoxicam and steroid injections in the treatment of impingement syndrome	/pubmed/25741915
4B	A multi-center, double-blind, randomized, placebo-controlled trial protocol to assess Traumeel injection vs dexamethasone injection in rotator cuff syndrome: the Traumeel in rotator cuff syndrome (TRARO) study protocol	/pubmed/25649543
4B	Effectiveness of blind & ultrasound guided corticosteroid injection in impingement syndrome	/pubmed/26925901
4B	The pain quality response profile of a corticosteroid injections and heated lidocaine/tetracaine patch in the treatment of shoulder impingement syndrome	/pubmed/25329142
4B	Determination of steroid injection sites using lidocaine test in adhesive capsulitis: a prospective randomized clinical trial	/pubmed/24965759
4B	Corticosteroid injection for shoulder pain: single-blind randomized pilot trial in primary care	/pubmed/24325987
4B	Is radiofrequency treatment effective for shoulder impingement syndrome? A prospective randomized controlled study	/pubmed/23994459
4A	Eccentric training for the treatment of tendinopathies	/pubmed/23669088

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
4B	Efficacies of corticosteroid injection at different sites of the shoulder for the treatment of adhesive capsulitis	/pubmed/22999847
4B	The effectiveness of injections of hyaluronic acid or corticosteroid in patients with subacromial impingement: a three-arm randomised controlled trial	/pubmed/22933498
4B	Image-guided versus blind glucocorticoid injection for shoulder pain	/pubmed/22895984
4B	Blind or ultrasound-guided corticosteroid injections and short-term response in subacromial impingement syndrome: a randomized, double-blind, prospective study	/pubmed/22561385
4B	Efficacy and safety of corticosteroid injections and other injections for management of tendinopathy: a systematic review of randomised controlled trials	/pubmed/20970844
4B	A double-blind randomised controlled study comparing subacromial injection of tenoxicam or methylprednisolone in patients with subacromial impingement	/pubmed/20044683
4B	[The contribution of subacromial injection to the conservative treatment of impingement syndrome]	/pubmed/19809230
4B, 10C, 2	Efficacy of multimodal analgesia injection combined with corticosteroids after arthroscopic rotator cuff repair	/pubmed/26563923
4B, 3B	Corticosteroid and other injections in the management of tendinopathies: a review	/pubmed/22064721
4B, 4C	Shockwave therapy for pain associated with upper extremity orthopedic disorders: a review of the clinical and cost-effectiveness [internet]	
4B, 4C	Extracorporeal shock wave therapy, ultrasound-guided percutaneous lavage, corticosteroid injection and combined treatment for the treatment of rotator cuff calcific tendinopathy: a network meta-analysis of RCTs	/pubmed/27554465
4B, 4C	Electrotherapy modalities for rotator cuff disease	/pubmed/27283591
4B, 4C	Extracorporeal shockwaves versus ultrasound-guided percutaneous lavage for the treatment of rotator cuff calcific tendinopathy: a randomized controlled trial	/pubmed/26365144
4B, 4C	Current knowledge on evidence-based shockwave treatments for shoulder pathology	/pubmed/26361863
4B, 4C	Are intra-articular corticosteroid injections better than conventional TENS in treatment of rotator cuff tendinitis in the short run? A randomized study	/pubmed/20926997
4B, 4C, 10C, 2	The effectiveness of high-energy extracorporeal shockwave therapy versus ultrasound-guided needling versus arthroscopic surgery in the management of chronic calcific rotator cuff tendinopathy: a systematic review	/pubmed/26382637
4B, 4C, 4A	Is radial extracorporeal shock wave therapy (rEWST) combined with supervised exercises (SE) more effective than sham rESWT and SE in patients with subacromial shoulder pain? Study protocol for a double-blind randomised, sham-controlled trial	/pubmed/26361756
4C	Short-term effects of high-intensity laser therapy, manual therapy, and kinesio taping in patients with subacromial impingement syndrome	/pubmed/27220527
4C	Efficiency of therapeutic ultrasound on pain, disability, anxiety, depression, sleep and quality of life in patients with subacromial impingement syndrome: a randomized controlled study	/pubmed/27002665

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
4C	Comparative effectiveness of ultrasonophoresis and iontophoresis in impingement syndrome: a double-blind, randomized, placebo controlled trial	/pubmed/25862770
4C	The efficacy of low-level laser therapy for shoulder tendinopathy: a systematic review and meta-analysis of randomized controlled trials	/pubmed/25450903
4C	High-energy extracorporeal shock-wave therapy for treating chronic calcific tendinitis of the shoulder: a systematic review	/pubmed/24733195
4C	Extracorporeal shock wave therapy for non-calcific supraspinatus tendinitis—10-year follow-up of a randomized placebo-controlled trial	/pubmed/24728846
4C	Low-level laser therapy versus ultrasound therapy in the treatment of subacromial impingement syndrome: a randomized clinical trial	/pubmed/24346151
4C	Clinical improvement and resorption of calcifications in calcific tendinitis of the shoulder after shock wave therapy at 6 months' follow-up: a systematic review and meta-analysis	/pubmed/23499780
4C	Extracorporeal shock-wave therapy for supraspinatus calcifying tendinitis: a randomized clinical trial comparing two different energy levels	/pubmed/22745199
4C	Short-term outcomes of extracorporeal shock wave therapy for the treatment of chronic non-calcific tendinopathy of the supraspinatus: a double-blind, randomized, placebo-controlled trial	/pubmed/22672772
4C	Radial extracorporeal shock wave therapy in the treatment of shoulder calcific tendinitis	/pubmed/22220440
4C	Extracorporeal shockwave therapy in calcifying tendinitis of the shoulder	/pubmed/21431373
4C	Evidence for effectiveness of extracorporeal shock-wave therapy (ESWT) to treat calcific and non-calcific rotator cuff tendinosis: a systematic review	/pubmed/21396877
4C	Reduced local perfusion after shock wave treatment of rotator cuff tendinopathy	/pubmed/21316560
4C	The midterm effectiveness of extracorporeal shockwave therapy in the management of chronic calcific shoulder tendinitis	/pubmed/21232988
4C	[Extracorporeal shock wave therapy (ESWT) and radial extracorporeal shock wave therapy (rESWT) in chronic musculoskeletal pain]	/pubmed/21139662
4C	The effectiveness of low laser therapy in subacromial impingement syndrome: a randomized placebo controlled double-blind prospective study	/pubmed/21120304
4C	High- versus low-energy extracorporeal shock wave therapy of rotator cuff tendinopathy: a prospective, randomised, controlled study	/pubmed/19774810
4C	Short-term effects of high-intensity laser therapy versus ultrasound therapy in the treatment of people with subacromial impingement syndrome: a randomized clinical trial	/pubmed/19482902
4C	Extracorporeal shock wave therapy in chronic calcific tendonitis of the shoulder: is it effective?	/pubmed/19358394
4C	Low-level laser therapy in subacromial impingement syndrome	/pubmed/19250050
4C	The effectiveness of low-level laser therapy on shoulder function in subacromial impingement syndrome	/pubmed/19031167
4C	Methylprednisolone versus triamcinolone in painful shoulder using ultrasound-guided injection	/pubmed/19023644

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
4C, 3C, 4A, 3A	Effectiveness of low-level laser therapy combined with an exercise program to reduce pain and increase function in adults with shoulder pain: a critically appraised topic	/pubmed/23069702
7A	A systematic review of preoperative fatty infiltration and rotator cuff outcomes	/pubmed/27385947
7A	Immunobiological factors aggravating the fatty infiltration on tendons and muscles in rotator cuff lesions	/pubmed/27160936
7A	Does preoperative subscapularis fatty muscle infiltration really matter in anterosuperior rotator cuff tears repair outcomes? A prospective multicentric study	/pubmed/24947497
7A	Fatty infiltration and rotator cuff atrophy	/pubmed/24084435
7A	Systematic review of rotator cuff tears in workers' compensation patients	/pubmed/22016341
7A	Role of fatty infiltration in the pathophysiology and outcomes of rotator cuff tears	/pubmed/21770040
7A	Do outcomes differ after rotator cuff repair for patients receiving workers' compensation?	/pubmed/18784971
7A	Difference in outcome of shoulder surgery between workers' compensation and nonworkers' compensation populations	/pubmed/18094970
7A, 7B	Systematic review on risk factors of rotator cuff tears	/pubmed/28211286
7A, 7B	Risk factors, pathobiomechanics and physical examination of rotator cuff tears	/pubmed/27708731
7A, 7B	2013 Neer Award: predictors of failure of nonoperative treatment of chronic, symptomatic, full-thickness rotator cuff tears	/pubmed/27422460
7A, 7B	Impact of cardiovascular risk factor on the prevalence and severity of symptomatic full-thickness rotator cuff tears	/pubmed/26321466
7A, 7B	Prognostic factors influencing the outcome of rotator cuff repair: a systematic review	/pubmed/26197937
7A, 7B	Factors affecting healing after arthroscopic rotator cuff repair	/pubmed/25793161
7A, 7B	Specific patient-related prognostic factors for rotator cuff repair: a systematic review	/pubmed/24725900
7A, 7B	Clinical, socio-demographic and radiological predictors of short-term outcome in rotator cuff disease	/pubmed/20950433
7B	Arthroscopy and obesity	/pubmed/26552647
7B	Smoking predisposes to rotator cuff pathology and shoulder dysfunction: a systematic review	/pubmed/25801046
7B	Obesity as a risk factor for tendinopathy: a systematic review	/pubmed/25214839
7B	The effect of smoking on rotator cuff and glenoid labrum surgery: a systematic review	/pubmed/24859982
7B	Does body mass index affect outcomes of ambulatory knee and shoulder surgery?	/pubmed/24731386
7B	Impact of diabetes mellitus on surgical outcomes in sports medicine	/pubmed/24231598
7B	The impact of aging on rotator cuff tear size	/pubmed/23588834
7B	Outcomes of arthroscopic rotator cuff repairs in obese patients	/pubmed/21324416
EMBASE Results		
2	Isolated subscapularis repair for massive rotator cuff tear	*Orthopedics.* 2014;37(11):e962-e967.
2	Outcome of rotator cuff repair in large-to-massive tear with pseudoparalysis: a comparative study with propensity score matching	*Am J Sports Med.* 2011;39(7):1413-1420.

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
2	Long-term survivorship and outcomes after surgical repair of full-thickness rotator cuff tears	*J Shoulder Elbow Surg.* 2011;20(4):591-597.
2	Surgical treatment of confirmed intratendinous rotator cuff tears: retrospective analysis after an average of eight years of follow-up	*J Shoulder Elbow Surg.* 2010;19(6):837-846.
2	Glenohumeral joint motion after subscapularis tendon repair: an analysis of cadaver shoulder models	*J Orthop Surg Res.* 2014;9:41.
2	Combined subscapularis tears in massive posterosuperior rotator cuff tears: do they affect postoperative shoulder function and rotator cuff integrity?	*Am J Sports Med.* 2016;44(1):183-190.
8	Biomechanical effects of acromioplasty on superior capsule reconstruction for irreparable supraspinatus tendon tears	*Am J Sports Med.* 2016;44(1):191-197.
9	Biomechanics of latissimus dorsi transfer for irreparable posterosuperior rotator cuff tears	*Clin Biomech.* 2009;24(3):261-266.
9	Recovery of active external rotation and elevation in young active men with irreparable posterosuperior rotator cuff tear using arthroscopically assisted latissimus dorsi transfer	*J Shoulder Elbow Surg.* 2016;25(9):e265-e275.
9	Pectoralis major transfer for the treatment of irreparable anterosuperior rotator cuff tears	*Int Orthop.* 2010;34(5):689-694.
9	Time-dependent changes after latissimus dorsi transfer: tenodesis or tendon transfer?	*Clin Orthop Relat Res.* 2014;472(12):3880-3888.
9	Latissimus dorsi tendon transfer for treatment of irreparable posterosuperior rotator cuff tears: long-term results at a minimum follow-up of ten years	*J Bone Joint Surg Am.* 2013;95(21):1920-1926.
9	Biomechanical effect of thickness and tension of fascia lata graft on glenohumeral stability for superior capsule reconstruction in irreparable supraspinatus tears	*Arthroscopy.* 2016;32(3):418-426.
9	Are there any prognostic prediction parameters (PPPs) in the treatment of the massive rotator cuff tear with latissimus dorsi transfer? Latissimus dorsi transfer in massive rotator cuff tears	*Acta Chir Orthop Traumatol Cech.* 2013;80(2).
9	Pigmented villonodular synovitis of the shoulder associated with massive rotator cuff tear treated by arthroscopic synovectomy and debridement	*Musculoskelet Surg.* 2013;97(suppl 1):S79-S84.
10C, 2	Clinical results of arthroscopic superior capsule reconstruction for irreparable rotator cuff tears	*Arthroscopy.* 2013;29(3):459-470.
10C, 2	Lesions of the rotator cuff footprint: diagnostic performance of MR arthrography compared with arthroscopy	*Musculoskelet Surg.* 2013;97(suppl 2):S197-S202.
10C, 2	Does open repair of anterosuperior rotator cuff tear prevent muscular atrophy and fatty infiltration?	*Clin Orthop Relat Res.* 2012;470(10):2776-2784.
10C, 2	Arthroscopic treatment of anterosuperior rotator cuff tears	*Orthopedics.* 2013;36(11):e1394-e1400.
10C, 2	Arthroscopic partial repair of irreparable, massive rotator cuff tears	*Arthrosc Tech.* 2017;6(1):e143-e147.
10C, 2	Arthroscopic repair of anterosuperior rotator cuff tears: InContinuity technique vs disruption of subscapularis supraspinatus tear margin comparison of clinical outcomes and structural integrity between the two techniques	*J Bone Joint Surg Am.* 2014;96(24):2056-2061.
10C, 2	An arthroscopic-plus-open method of repair for combined tears of the subscapularis, supraspinatus, and infraspinatus tendons	*Am J Orthop (Belle Mead NJ).* 2009;38(12):602-605.
10C, 2	The isolated subscapularis tendon tear: arthroscopic and open repair [German]	*Operative Orthopadie und Traumatologie.* 2012;24(6):468-478.

(continued)

TABLE A3 (continued)

Recommendation Addressed	Title	Identification
10C, 2	The clinical and structural long-term results of open repair of massive tears of the rotator cuff	*J Bone Joint Surg Am.* 2008;90(11):2423-2431.
10C, 2	Arthroscopic partial repair of irreparable rotator cuff tears: preoperative factors associated with outcome deterioration over 2 years	*Am J Sports Med.* 2015;43(8):1965-1975.
10C, 2	Outcome of arthroscopic rotator cuff repair in large tears: the exposed footprint	*Acta Orthop Belg.* 2011;77(6):743-750.
10C, 2	Arthroscopic repair techniques for massive rotator cuff tears	*Inst Course Lect.* 2012;61:121-130.
10C, 2	Arthroscopic repair of concomitant type II SLAP lesions in large to massive rotator cuff tears: comparison with biceps tenotomy	*Am J Sports Med.* 2012;40(12):2786-2793.
10C, 2	Transtendon arthroscopic repair of high grade partial-thickness articular surface tears of the rotator cuff with biceps tendon augmentation: technical note and preliminary results	*Arch Orthop Trauma Surg.* 2011;1-8.
11A	Effect of platelet-rich plasma and porcine dermal collagen graft augmentation for rotator cuff healing in a rabbit model	*Am J Sports Med.* 2013;41(12):2909-2918.
11A	The benefit of synthetic versus biological patch augmentation in the repair of posterosuperior massive rotator cuff tears: a 3-year follow-up study	*Am J Sports Med.* 2014;42(5):1169-1175.
11A	Treatment of massive rotator-cuff tears with a polyester ligament (LARS) patch	*Acta Orthop Belg.* 2013;79(6):620-625.
11B	Dermal tissue allograft for the repair of massive irreparable rotator cuff tears	*Am J Sports Med.* 2012;40(1):141-147.
13A	Optimal shoulder immobilization postures following surgical repair of rotator cuff tears: a simulation analysis	*J Shoulder Elbow Surg.* 2013;22(8):1011-1018.
13A	Estimating optimal shoulder immobilization postures following surgical repair of massive rotator cuff tears	*J Biomech.* 2013;46(1):179-182.
2, 11B	Massive or 2-tendon rotator cuff tears in active patients with minimal glenohumeral arthritis: clinical and radiographic outcomes of reconstruction using dermal tissue matrix xenograft	*Am J Sports Med.* 2013;41(4):872-879.
3A	Predictors of pain and function in patients with symptomatic, atraumatic full-thickness rotator cuff tears: a time-zero analysis of a prospective patient cohort enrolled in a structured physical therapy program	*Am J Sports Med.* 2012;40(2):359-366.
3A	Effects of exercise therapy for the treatment of symptomatic full-thickness supraspinatus tears on in vivo glenohumeral kinematics	*J Shoulder Elbow Surg.* 2016;25(4):641-649.
7A	Fatty degeneration of the rotator cuff muscles on pre- and postoperative CT arthrography (CTA): is the Goutallier grading system reliable?	*Skeletal Radiol.* 2013;42(9):1259-1267.
7A	Fatty degeneration and atrophy of the rotator cuff muscles after arthroscopic repair: does it improve, halt or deteriorate?	*Arch Orthop Trauma Surg.* 2014;134(7):985-990.
7A	Changes in appearance of fatty infiltration and muscle atrophy of rotator cuff muscles on magnetic resonance imaging after rotator cuff repair: establishing new time-zero traits	*Arthroscopy.* 2013;29(3):449-458.
7A	Morphologic risk factors in predicting symptomatic structural failure of arthroscopic rotator cuff repairs: tear size, location, and atrophy matter	*Arthroscopy.* 2016;32(10):1947-1952.
7A	The factors affecting the clinical outcome and integrity of arthroscopically repaired rotator cuff tears of the shoulder	*Clin Orthop Surg.* 2009;1(2):96-104.
7A, 10C, 2	Effect of fatty degeneration of the infraspinatus on the efficacy of arthroscopic patch autograft procedure for large to massive rotator cuff tears	*Am J Sports Med.* 2015;43(5):1108-1117.

TABLE A4
Studies Directly Addressing the AAOS Recommendations, by Study Type and Recommendation Addressed

Title	Type of Study	Recommendation
Clinical and radiological outcome of conservative vs. surgical treatment of atraumatic degenerative rotator cuff rupture: design of a randomized controlled trial	Randomized trial	1
Treatment of non-traumatic rotator cuff tears: a randomised controlled trial with one-year clinical results	Randomized trial	1
Surgical treatment of rotator cuff tears after 65 years of age: a systematic review	Systematic review	2
Initial treatment of complete rotator cuff tear and transition to surgical treatment: systematic review of the evidence	Systematic review	2
Repair of full-thickness rotator cuff tears in patients aged younger than 55 years	Systematic review	2
Intraoperative determinants of rotator cuff repair integrity: an analysis of 500 consecutive repairs	Cohort	2
Operative management of partial- and full-thickness rotator cuff tears	Review	2
Prospective analysis of arthroscopic rotator cuff repair: subgroup analysis	Case series	2
Isolated subscapularis repair for massive rotator cuff tear	Retrospective	2
Outcome of rotator cuff repair in large-to-massive tear with pseudoparalysis: a comparative study with propensity score matching	Cohort	2
Long-term survivorship and outcomes after surgical repair of full-thickness rotator cuff tears	Retrospective	2
Combined subscapularis tears in massive posterosuperior rotator cuff tears: do they affect postoperative shoulder function and rotator cuff integrity?	Cohort	2
Arthroscopic partial repair of irreparable, massive rotator cuff tears	Case series	2
Arthroscopic repair of anterosuperior rotator cuff tears: InContinuity technique vs. disruption of subscapularis supraspinatus tear margin comparison of clinical outcomes and structural integrity between the two techniques	Review	2
The clinical and structural long-term results of open repair of massive tears of the rotator cuff	Case series	2
Arthroscopic partial repair of irreparable rotator cuff tears: preoperative factors associated with outcome deterioration over 2 years	Case series	2
Outcome of arthroscopic rotator cuff repair in large tears: the exposed footprint	Retrospective	2
Arthroscopic repair of concomitant type II SLAP lesions in large to massive rotator cuff tears: comparison with biceps tenotomy	Cohort	2
Massive or 2-tendon rotator cuff tears in active patients with minimal glenohumeral arthritis: clinical and radiographic outcomes of reconstruction using dermal tissue matrix xenograft	Case series	2
Arthroscopic repair for chronic massive rotator cuff tears: a systematic review	Systematic review	2
Clinical and structural outcomes after arthroscopic repair of full-thickness rotator cuff tears with and without platelet-rich product supplementation: a meta-analysis and meta-regression	Meta-analysis	2
Comparison of functional gains after arthroscopic rotator cuff repair in patients over 70 years of age versus patients under 50 years of age: a prospective multicenter study	Case series	2
Arthroscopic treatment options for irreparable rotator cuff tears of the shoulder	Review	2
Arthroscopic versus mini-open rotator cuff repair: a prospective, randomized study with 24-month follow-up	Randomized trial	2
Combined tears of the subscapularis and supraspinatus tendon: clinical outcome, rotator cuff strength and structural integrity following open repair	Prospective nonrandomized	2
Outcomes of arthroscopic versus open rotator cuff repair: a systematic review of the literature	Systematic review	2
Treating full-thickness cuff tears in the athlete: advances in arthroscopic techniques	Review	2
Massive rotator cuff tears: arthroscopy to arthroplasty	Review	2
Arthroscopic repair of full-thickness rotator cuff tears with and without acromioplasty: randomized prospective trial with 2-year follow-up	Randomized trial	2
Single-row or double-row fixation technique for full-thickness rotator cuff tears: a meta-analysis	Meta-analysis	2
Single-row repair versus double-row repair of full-thickness rotator cuff tears	Meta-analysis	2
The clinical effect of a rotator cuff retear: a meta-analysis of arthroscopic single-row and double-row repairs	Meta-analysis	2
Arthroscopic single-row versus double-row technique for repairing rotator cuff tears: a systematic review and meta-analysis	Systematic review	2
Surgery or conservative treatment for rotator cuff tear: a meta-analysis	Meta-analysis	2
Arthroscopic rotator cuff repair with and without acromioplasty in the treatment of full-thickness rotator cuff tears: a multicenter, randomized controlled trial	Randomized trial	2
Predictors of pain and function in patients with symptomatic, atraumatic full-thickness rotator cuff tears: a time-zero analysis of a prospective patient cohort enrolled in a structured physical therapy program	Cohort	3A
Effects of exercise therapy for the treatment of symptomatic full-thickness supraspinatus tears on in vivo glenohumeral kinematics	Case series	3A

(continued)

TABLE A4 (continued)

Title	Type of Study	Recommendation
Effectiveness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study	Cohort	3A
Treatment of non-traumatic rotator cuff tears: a randomised controlled trial with one-year clinical results	Randomized trial	3A
Surgery or conservative treatment for rotator cuff tear: a meta-analysis	Meta-analysis	3A
Treatment of nontraumatic rotator cuff tears: a randomized controlled trial with two years of clinical and imaging follow-up	Randomized trial	3A
Injection of the subacromial bursa in patients with rotator cuff syndrome: a prospective, randomized study comparing the effectiveness of different routes	Randomized trial	3B
Effects of corticosteroids injection in rotator cuff tears	Randomized trial	3B
Exercise for rotator cuff tendinopathy: a systematic review	Systematic review	4A
Evaluation of the effectiveness of three physiotherapeutic treatments for subacromial impingement syndrome: a randomised clinical trial	Randomized trial	4A
A specific exercise strategy reduced the need for surgery in subacromial pain patients	Randomized trial	4A
The efficacy of oral non-steroidal anti-inflammatory drugs for rotator cuff tendinopathy: a systematic review and meta-analysis	Systematic review	4A
The effectiveness of physiotherapy exercises in subacromial impingement syndrome: a systematic review and meta-analysis	Systematic review	4A
Effect of specific exercise strategy on need for surgery in patients with subacromial impingement syndrome: randomised controlled study	Randomized trial	4A
High-dosage medical exercise therapy in patients with long-term subacromial shoulder pain: a randomized controlled trial	Randomized trial	4A
Efficacy of standardised manual therapy and home exercise programme for chronic rotator cuff disease: randomised placebo controlled trial	Randomized trial	4A
Exercise in the treatment of rotator cuff impingement: a systematic review and a synthesized evidence-based rehabilitation protocol	Systematic review	4A
A double-blind randomized controlled trial comparing the effects of subacromial injection with corticosteroid versus NSAID in patients with shoulder impingement syndrome	Randomized trial	4A
Intra-articular and soft tissue injections, a systematic review of relative efficacy of various corticosteroids	Systematic review	4B
Imaging-guided subacromial therapeutic injections: prospective study comparing abnormalities on conventional radiography with patient outcomes	Systematic review	4B
Calcific tendinitis of the rotator cuff: a randomized controlled trial of ultrasound-guided needling and lavage versus subacromial corticosteroids	Randomized trial	4B
Subacromial ultrasound guided or systemic steroid injection for rotator cuff disease: randomised double blind study	Randomized trial	4B
One-year outcome of subacromial corticosteroid injection compared with manual physical therapy for the management of the unilateral shoulder impingement syndrome: a pragmatic randomized trial	Randomized trial	4B
Subacromial impingement syndrome and pain: protocol for a randomised controlled trial of exercise and corticosteroid injection (the SUPPORT trial)	Randomized trial	4B
Pulsed electromagnetic field and exercises in patients with shoulder impingement syndrome: a randomized, double-blind, placebo-controlled clinical trial	Randomized trial	4B
Subacromial impingement syndrome: effectiveness of pharmaceutical interventions-nonsteroidal anti-inflammatory drugs, corticosteroid, or other injections: a systematic review	Systematic review	4B
A double-blind randomized controlled trial comparing the effects of subacromial injection with corticosteroid versus NSAID in patients with shoulder impingement syndrome	Randomized trial	4B
CORR Insights®: corticosteroid injections give small and transient pain relief in rotator cuff tendinosis: a meta-analysis	Meta-analysis	4B
Corticosteroid injections give small and transient pain relief in rotator cuff tendinosis: a meta-analysis	Meta-analysis	4B
Comparison of subacromial tenoxicam and steroid injections in the treatment of impingement syndrome	Randomized trial	4B
A multi-center, double-blind, randomized, placebo-controlled trial protocol to assess Traumeel injection vs dexamethasone injection in rotator cuff syndrome: the Traumeel in rotator cuff syndrome (TRARO) study protocol	Randomized trial	4B
Effectiveness of blind & ultrasound guided corticosteroid injection in impingement syndrome	Randomized trial	4B
The effectiveness of injections of hyaluronic acid or corticosteroid in patients with subacromial impingement: a three-arm randomised controlled trial	Randomized trial	4B

(continued)

TABLE A4 (continued)

Title	Type of Study	Recommendation
Blind or ultrasound-guided corticosteroid injections and short-term response in subacromial impingement syndrome: a randomized, double-blind, prospective study	Randomized trial	4B
A double-blind randomised controlled study comparing subacromial injection of tenoxicam or methylprednisolone in patients with subacromial impingement	Randomized trial	4B
Extracorporeal shock wave therapy, ultrasound-guided percutaneous lavage, corticosteroid injection and combined treatment for the treatment of rotator cuff calcific tendinopathy: a network meta-analysis of RCTs	Meta-analysis	4B
Are intra-articular corticosteroid injections better than conventional TENS in treatment of rotator cuff tendinitis in the short run? A randomized study	Randomized trial	4B
The effectiveness of high-energy extracorporeal shockwave therapy versus ultrasound-guided needling versus arthroscopic surgery in the management of chronic calcific rotator cuff tendinopathy: a systematic review	Systematic review	4B
Efficacy of transcutaneous electrical nerve stimulation for rotator cuff tendinopathy: a systematic review	Systematic review	4C
The efficacy of therapeutic ultrasound for rotator cuff tendinopathy: a systematic review and meta-analysis	Systematic review	4C
Are ultrasound, laser and exercise superior to each other in the treatment of subacromial impingement syndrome? A randomized clinical trial	Randomized trial	4C
Supervised exercises compared with radial extracorporeal shock-wave therapy for subacromial shoulder pain: 1-year results of a single-blind randomized controlled trial	Randomized trial	4C
Radial extracorporeal shockwave treatment compared with supervised exercises in patients with subacromial pain syndrome: single blind randomised study	Randomized trial	4C
Extracorporeal shockwaves versus ultrasound-guided percutaneous lavage for the treatment of rotator cuff calcific tendinopathy: a randomized controlled trial	Randomized trial	4C
Are intra-articular corticosteroid injections better than conventional TENS in treatment of rotator cuff tendinitis in the short run? A randomized study	Randomized trial	4C
The effectiveness of high-energy extracorporeal shockwave therapy versus ultrasound-guided needling versus arthroscopic surgery in the management of chronic calcific rotator cuff tendinopathy: a systematic review	Systematic review	4C
Efficiency of therapeutic ultrasound on pain, disability, anxiety, depression, sleep and quality of life in patients with subacromial impingement syndrome: a randomized controlled study	Randomized trial	4C
Comparative effectiveness of ultrasonophoresis and iontophoresis in impingement syndrome: a double-blind, randomized, placebo controlled trial	Randomized trial	4C
The efficacy of low-level laser therapy for shoulder tendinopathy: a systematic review and meta-analysis of randomized controlled trials	Systematic review	4C
High-energy extracorporeal shock-wave therapy for treating chronic calcific tendinitis of the shoulder: a systematic review	Systematic review	4C
Extracorporeal shock wave therapy for non-calcific supraspinatus tendinitis—10-year follow-up of a randomized placebo-controlled trial	Randomized trial	4C
Low-level laser therapy versus ultrasound therapy in the treatment of subacromial impingement syndrome: a randomized clinical trial	Randomized trial	4C
Clinical improvement and resorption of calcifications in calcific tendinitis of the shoulder after shock wave therapy at 6 months' follow-up: a systematic review and meta-analysis	Systematic review	4C
Extracorporeal shock-wave therapy for supraspinatus calcifying tendinitis: a randomized clinical trial comparing two different energy levels	Randomized trial	4C
Short-term outcomes of extracorporeal shock wave therapy for the treatment of chronic non-calcific tendinopathy of the supraspinatus: a double-blind, randomized, placebo-controlled trial	Randomized trial	4C
Radial extracorporeal shock wave therapy in the treatment of shoulder calcific tendinitis	Cohort	4C
Extracorporeal shockwave therapy in calcifying tendinitis of the shoulder	Prospective	4C
Evidence for effectiveness of extracorporeal shock-wave therapy (ESWT) to treat calcific and non-calcific rotator cuff tendinosis: a systematic review	Systematic review	4C
The midterm effectiveness of extracorporeal shockwave therapy in the management of chronic calcific shoulder tendinitis	Systematic review	4C
The effectiveness of low laser therapy in subacromial impingement syndrome: a randomized placebo controlled double-blind prospective study	Randomized trial	4C
High- versus low-energy extracorporeal shock wave therapy of rotator cuff tendinopathy: a prospective, randomised, controlled study	Randomized trial	4C
Short-term effects of high-intensity laser therapy versus ultrasound therapy in the treatment of people with subacromial impingement syndrome: a randomized clinical trial	Randomized trial	4C

(continued)

TABLE A4 (continued)

Title	Type of Study	Recommendation
Dexamethasone for pain after outpatient shoulder surgery: a randomised, double-blind, placebo-controlled trial	Randomized trial	6
A systematic review of preoperative fatty infiltration and rotator cuff outcomes	Systematic review	7A
Does preoperative subscapularis fatty muscle infiltration really matter in anterosuperior rotator cuff tears repair outcomes? A prospective multicentric study	Cohort	7A
Fatty infiltration and rotator cuff atrophy	Review	7A
Systematic review of rotator cuff tears in workers' compensation patients	Systematic review	7A
Role of fatty infiltration in the pathophysiology and outcomes of rotator cuff tears	Review	7A
Do outcomes differ after rotator cuff repair for patients receiving workers' compensation?	Prognostic	7A
Difference in outcome of shoulder surgery between workers' compensation and nonworkers' compensation populations	Systematic review	7A
Prognostic factors influencing the outcome of rotator cuff repair: a systematic review	Systematic review	7A
Factors affecting healing after arthroscopic rotator cuff repair	Review	7A
Specific patient-related prognostic factors for rotator cuff repair: a systematic review	Systematic review	7A
Clinical, socio-demographic and radiological predictors of short-term outcome in rotator cuff disease	Randomized trial	7A
Changes in appearance of fatty infiltration and muscle atrophy of rotator cuff muscles on magnetic resonance imaging after rotator cuff repair: establishing new time-zero traits	Case series	7A
Morphologic risk factors in predicting symptomatic structural failure of arthroscopic rotator cuff repairs: tear size, location, and atrophy matter	Retrospective	7A
The factors affecting the clinical outcome and integrity of arthroscopically repaired rotator cuff tears of the shoulder	Retrospective	7A
Long-term functional outcomes after repair of rotator cuff tears correlated with atrophy of the supraspinatus muscles on magnetic resonance images	Case series	7A
2013 Neer Award: predictors of failure of nonoperative treatment of chronic, symptomatic, full-thickness rotator cuff tears	Cohort	7B
Prognostic factors influencing the outcome of rotator cuff repair: a systematic review	Systematic review	7B
Factors affecting healing after arthroscopic rotator cuff repair	Review	7B
Specific patient-related prognostic factors for rotator cuff repair: a systematic review	Systematic review	7B
Smoking predisposes to rotator cuff pathology and shoulder dysfunction: a systematic review	Systematic review	7B
The effect of smoking on rotator cuff and glenoid labrum surgery: a systematic review	Systematic review	7B
Impact of diabetes mellitus on surgical outcomes in sports medicine	Review	7B
Outcomes of arthroscopic rotator cuff repairs in obese patients	Retrospective	7B
Does concomitant acromioplasty facilitate arthroscopic repair of full-thickness rotator cuff tears? A meta-analysis with trial sequential analysis of randomized controlled trials	Meta-analysis	8
Is acromioplasty necessary in the setting of full-thickness rotator cuff tears? A systematic review	Systematic review	8
The efficacy of acromioplasty in the arthroscopic repair of small- to medium-sized rotator cuff tears without acromial spur: prospective comparative study	Prospective comparative study	8
Arthroscopic treatment of rotator cuff tear in the over-60s: repair is preferable to isolated acromioplasty-tenotomy in the short term	Randomized trial	8
Arthroscopic repair of full-thickness rotator cuff tears with and without acromioplasty: randomized prospective trial with 2-year follow-up	Randomized trial	8
Arthroscopic rotator cuff repair with and without acromioplasty in the treatment of full-thickness rotator cuff tears: a multicenter, randomized controlled trial	Randomized trial	8
Improved external rotation with concomitant reverse total shoulder arthroplasty and latissimus dorsi tendon transfer: a systematic review	Systematic review	9
Latissimus dorsi transfer in posterior irreparable rotator cuff tears	Review	9
[Irreparable rotator cuff tears: debridement, partial reconstruction, tendon transfer or reversed shoulder arthroplasty]	Review	9
Tendon transfer for irreparable rotator cuff tears: indications and surgical rationale	Review	9
Arthroscopic-assisted latissimus dorsi tendon transfer for irreparable posterosuperior cuff tears	Case series	9
Pectoralis major transfer for treatment of irreparable subscapularis tear: a systematic review	Systematic review	9
Humeral resurfacing arthroplasty in combination with latissimus dorsi tendon transfer in patients with rotator cuff tear arthropathy and preserved subscapularis muscle function: preliminary report and short-term results	Case series	9
Tendon transfers for irreparable rotator cuff tears	Review	9
Latissimus dorsi tendon transfer for irreparable rotator cuff tears: a systematic review	Systematic review	9
Latissimus dorsi tendon transfer for massive irreparable rotator cuff tears: a systematic review	Systematic review	9
Time-dependent changes after latissimus dorsi transfer: tenodesis or tendon transfer?	Therapeutic	9

(continued)

TABLE A4 (continued)

Title	Type of Study	Recommendation
Latissimus dorsi tendon transfer for treatment of irreparable posterosuperior rotator cuff tears: long-term results at a minimum follow-up of ten years	Therapeutic	9
Improved external rotation with concomitant reverse total shoulder arthroplasty and latissimus dorsi tendon transfer: a systematic review	Systematic review	9
Comparison of clinical outcomes in all-arthroscopic versus mini-open repair of rotator cuff tears: a randomized clinical trial	Randomized trial	10C
Which method of rotator cuff repair leads to the highest rate of structural healing? A systematic review	Systematic review	10C
Systematic review of all-arthroscopic versus mini-open repair of rotator cuff tears: a meta-analysis	Systematic review	10C
Clinical effectiveness and cost-effectiveness of open and arthroscopic rotator cuff repair [the UK Rotator Cuff Surgery (UKUFF) randomised trial]	Randomized trial	10C
Arthroscopic versus mini-open rotator cuff repair: an up-to-date meta-analysis of randomized controlled trials	Meta-analysis	10C
All-arthroscopic versus mini-open repair of small to large sized rotator cuff tears: a meta-analysis of clinical outcomes	Meta-analysis	10C
Arthroscopic versus mini-open rotator cuff repair: a prospective, randomized study with 24-month follow-up	Randomized trial	10C
Clinical outcome in all-arthroscopic versus mini-open rotator cuff repair in small to medium-sized tears: a randomized controlled trial in 100 patients with 1-year follow-up	Randomized trial	10C
Early postoperative outcomes between arthroscopic and mini-open repair for rotator cuff tears	Randomized trial	10C
Outcomes of arthroscopic versus open rotator cuff repair: a systematic review of the literature	Systematic review	10C
Prospective randomised comparison of arthroscopic versus mini-open rotator cuff repair of the supraspinatus tendon	Randomized trial	10C
Evaluating equivalency of treatment effectiveness: the example of arthroscopic and mini-open rotator cuff repairs	Review	10C
Open, mini-open, and all-arthroscopic rotator cuff repair surgery: indications and implications for rehabilitation	Commentary	10C
Effectiveness of open and arthroscopic rotator cuff repair (UKUFF): a randomised controlled trial	Randomized trial	10C
Costs, quality of life and cost-effectiveness of arthroscopic and open repair for rotator cuff tears: an economic evaluation alongside the UKUFF trial	Randomized trial	10C
Efficacy of different rotator cuff repair techniques	Review	10C
A randomized clinical trial to compare the effectiveness of rotator cuff repair with or without augmentation using porcine small intestine submucosa for patients with moderate to large rotator cuff tears: a pilot study	Randomized trial	11A
Can grafts provide superior tendon healing and clinical outcomes after rotator cuff repairs? A meta-analysis	Meta-analysis	11A
Graft augmentation versus bridging for large to massive rotator cuff tears: a systematic review	Systematic review	11A
Outcomes after patch use in rotator cuff repair	Systematic review	11A
Graft utilization in the augmentation of large-to-massive rotator cuff repairs: a systematic review	Systematic review	11A
Graft utilization in the bridging reconstruction of irreparable rotator cuff tears: a systematic review	Systematic review	11A, 11B
Can grafts provide superior tendon healing and clinical outcomes after rotator cuff repairs? A meta-analysis	Meta-analysis	11A, 11B
Graft augmentation versus bridging for large to massive rotator cuff tears: a systematic review	Systematic review	11A, 11B
Graft utilization in the augmentation of large-to-massive rotator cuff repairs: a systematic review	Systematic review	11A, 11B
Dermal tissue allograft for the repair of massive irreparable rotator cuff tears	Observational	11B
Compressive cryotherapy versus ice—a prospective, randomized study on postoperative pain in patients undergoing arthroscopic rotator cuff repair or subacromial decompression	Randomized trial	12
Does a brace influence clinical outcomes after arthroscopic rotator cuff repair?	Prospective nonrandomized	13A
Immobilization after rotator cuff repair: what evidence do we have now?	Review	13B
Does immobilization after arthroscopic rotator cuff repair increase tendon healing? A systematic review and meta-analysis	Systematic review	13B
Early passive motion versus immobilization after arthroscopic rotator cuff repair	Meta-analysis	13B
Effect of immobilization without passive exercise after rotator cuff repair: randomized clinical trial comparing four and eight weeks of immobilization	Randomized trial	13B
Immediate passive motion versus immobilization after endoscopic supraspinatus tendon repair: a prospective randomized study	Randomized trial	13B
Rehabilitation following arthroscopic rotator cuff repair: a prospective randomized trial of immobilization compared with early motion	Randomized trial	13B

(continued)

TABLE A4 (continued)

Title	Type of Study	Recommendation
Rehabilitation after rotator cuff repair	Review	13C
Effectiveness of early compared with conservative rehabilitation for patients having rotator cuff repair surgery: an overview of systematic reviews	Systematic review	13C
A comparison of rehabilitation methods after arthroscopic rotator cuff repair: a systematic review	Systematic review	13C
Rehabilitation following arthroscopic rotator cuff repair: a review of current literature	Review	13C
[Comparison of the results of supervised physiotherapy program and home-based exercise program in patients treated with arthroscopic-assisted mini-open rotator cuff repair]	Prospective nonrandomized	13D
Supervised versus uncontrolled rehabilitation of patients after rotator cuff repair—clinical and neurophysiological comparative study	Randomized trial	13D
Supervised strengthening exercises versus home-based movement exercises after arthroscopic acromioplasty: a randomized clinical trial	Randomized trial	13D
Massive or 2-tendon rotator cuff tears in active patients with minimal glenohumeral arthritis: clinical and radiographic outcomes of reconstruction using dermal tissue matrix xenograft	Case series	2, 11B
Administration of analgesics after rotator cuff repair: a prospective clinical trial comparing glenohumeral, subacromial, and a combination of glenohumeral and subacromial injections	Randomized trial	14
Postoperative fentanyl patch versus subacromial bupivacaine infusion in arthroscopic shoulder surgery	Randomized trial	14
Efficacy of continuous subacromial bupivacaine infusion for pain control after arthroscopic rotator cuff repair	Randomized trial	14