



Australian Government

Department of Health

MSAC Application 1711:
Management of rotator cuff disease
Clinical guidelines review

Report to MSAC

Terms of Reference 1 – Draft report for consultation

This document has been completed as part of a review of existing services provided through the Medicare Benefits Schedule (MBS).

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Executive summary

This document is one component of a review of subacromial decompression, undertaken for the Medical Services Advisory Committee (MSAC). This clinical guidelines review addresses *Terms of Reference 1: Review clinical guidelines on the management of rotator cuff disease*, taking account of the clinical characteristics of the population/s recommended for subacromial decompression (with/without rotator cuff repair).

A systematic search identified a total of 31 clinical guideline documents related to rotator cuff disease of which 14 (including two specialty society statements) provide recommendations regarding the use of surgery, including rotator cuff repair and subacromial decompression. All clinical practice guidelines (CPGs) were evidence-based, and three guidelines were appraised to be of better quality.

The identified guidelines were of varying quality and detail. Many provided advice across the entirety of the care pathway. Others focused solely on specific aspects of care such as radiology and imaging, or activities in primary care. The guidelines were consistent in recommending a stepped approach to care and a targeted selection of patients for surgical management, only when patients had tried and failed to respond to appropriate conservative therapy.

For care prior to surgery, guidelines were broadly consistent in their recommendations. Patients should undergo a review of history and physical examination. Where reported, all guidelines recommended physiotherapy or structured exercise as the initial therapy (for 6 to 12 weeks), often with some kind of simple analgesic or anti-inflammatory medication to help control symptoms. The judicious use of subacromial injection of steroid or local anaesthetic is recommended to reduce pain in the short term, if required. For patients with acute full-thickness rotator cuff tears (FTT), a trial of non-surgical therapy was not always needed.

However, guidelines were more varied in terms of their recommendations pertaining to radiology and imaging. This may be related to the focus of each document. Documents with a particular focus on therapies generally provided less detail on radiology and imaging, and did not distinguish between the use of specific tests in the care pathway. Guidelines that provided more detail on these tests were consistent in that radiology or imaging early in the clinical pathway is not needed unless there is a concern of a serious pathology. The initial test should be X-ray. Ultrasound or magnetic resonance imaging (MRI) were recommended later in the care pathway, only after patients had failed the initial conservative therapy, and to assess soft tissues before patients are considered for surgery.

For surgery, the detail provided in guidelines also varied in terms of how, when and to whom certain services should be provided. For FTT, guidelines were consistent in recommending repair. For partial-thickness rotator cuff tears (PTT), guidelines were generally consistent in recommending repair for patients who had persistent symptoms despite a specified duration of conservative therapy (6 weeks). Debridement was an option for PTT in three guidelines.

The use of **subacromial decompression during rotator cuff surgery** was recommended as an option in one guideline. Specific patient criteria were not provided. Subacromial decompression was specified as 'not for routine use' in three guidelines, and explicitly excluded in two guidelines.

Subacromial decompression as a standalone procedure is explicitly excluded in two guidelines, for the indications of subacromial impingement syndrome, and for subacromial pain syndrome or rotator cuff disease. Nine guidelines recommended the procedure in a restricted population. The detail for patient selection varied across guidelines. However, in all cases patients had to have ongoing symptoms despite a

period (6 weeks to 6 months) of conservative therapy, and in most cases were required to have been diagnosed with subacromial impingement.

In terms of the current and proposed MBS items, there is no detail on the patient population or previous tests or therapies, therefore the alignment of their use to best practice is uncertain.

This draft report will be released for consultation so that stakeholder views are considered.

Purpose of this report

Between 2015 and 2020, the Australian Government undertook a review of the Medicare Benefits Schedule (MBS) (MBS Review) to consider how MBS items could be better aligned with contemporary clinical evidence and practice, to improve health outcomes (Australian Government Department of Health 2021b). The MBS Review Taskforce provided its final report to the Minister for Health in 2020 (Medical Benefits Review Taskforce 2019). The current MBS items for subacromial decompression and rotator cuff repair have been available since 1991, and have not previously been assessed by the MSAC. In its report on Orthopaedic MBS items, the Taskforce recommended that these current items should be consolidated (recommendation 74, 75) (MBS Review 2019). The existing and proposed items are shown in Appendix A.

In 2020, MSAC recommended that the MSAC Executive review the MBS item 48903 for shoulder subacromial decompression surgery (MSAC 2020). During its deliberations, the MSAC Executive noted that the clinical benefit of subacromial decompression compared to conservative management was uncertain and advised that a review was required prior to the implementation of the recommendations pertaining to subacromial decompression with and without rotator cuff repair (Australian Government Department of Health 2021a, Beard et al. 2018, Farfaras et al. 2018, Karjalainen et al. 2019a, Karjalainen et al. 2019b).

The review of subacromial decompression includes four terms of reference:

- Terms of Reference 1: Review clinical guidelines on the management of rotator cuff disease, taking account of the clinical characteristics of the population/s recommended for subacromial decompression (with/without rotator cuff repair).
- Terms of Reference 2: Review the utilisation of subacromial decompression services, informed by MBS data and other data that may provide additional insight into clinical use.
- Terms of Reference 3: Review evidence on comparative safety and clinical effectiveness of subacromial decompression (with/without rotator cuff repair) used in the management of rotator cuff disease. The evidence review will be based on the Population, Intervention, Comparator and Outcomes (PICO) confirmation ratified by the PICO Advisory Subcommittee (PASC).
- Terms of Reference 4: Subject to the findings of Terms of Reference 1, 2 and 3, to review and evaluate the cost effectiveness of subacromial decompression (with/without rotator cuff repair).

This report (Terms of Reference 1) summarises information from published clinical guidelines on rotator cuff disease, including the use of subacromial decompression. Particular focus is on the clinical characteristics of the population/s recommended for subacromial decompression (with or without rotator cuff repair).

Separate and parallel to this guidelines review, a PICO Confirmation is being developed with the Protocol Advisory Sub-Committee (PASC), which will formally define the PICO, clinical management algorithm and research questions for a Department Contracted Assessment Report.

Rotator cuff disease and subacromial impingement

Rotator cuff disease is an umbrella term used to encapsulate all symptomatic disorders of the rotator cuff that can result in pain, weakness, instability and dysfunction in the shoulder joint regardless of pathology or anatomical location (Migliorini et al. 2021, Whittle and Buchbinder 2015). Rotator cuff tears involve one or more of the tendons of the rotator cuff, and shoulder impingement or subacromial impingement syndrome is a common cause of shoulder pain where a rotator cuff tendon rubs or catches on nearby tissue and bone as the arm is lifted (NHS 2020). These two conditions are responsible for up to 65% to 85% of shoulder pain (Brindisino et al. 2021, Karjalainen et al. 2019a, Thorpe et al. 2016, Whittle and Buchbinder 2015, Jones et al. 2019).

Patients present with shoulder pain, weakness and dysfunction, and can be diagnosed through a range of clinical and physical tests and examinations. Radiology and imaging can also be used to further describe the pathophysiology. A range of therapies are available including conservative therapy and surgical options.

Methods

A mixed-methods approach was taken with systematic literature searches supplemented with targeted web searches of specialty societies and guideline databases (Appendix B). Search methods were taken from two recent systematic reviews (Doiron-Cadrin et al. 2020, Moshi et al. 2021).

Guidelines, statements and consensus on topics related to sore shoulder, shoulder injury, subacromial impingement syndrome and rotator cuff were included. The guidelines selection was triaged. All guidelines, regardless of the stage of clinical care, are included for a narrative overview. Due to the focus of this subacromial decompression review on MBS items for surgical services, only guidelines that discuss the use of surgery were critically appraised.

The methodology is described in Appendix B. The search included Australian and international guidance documents. Relevant guidance documents were appraised for quality using the Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument (Appendix C).

Identified clinical guidelines

The results of the literature review are described in a PRISMA flow diagram (**Error! Reference source not found.**). Twenty nine guidance documents for the management of rotator cuff disease were identified (Table 5).

Guideline overview

The identified guidelines contained a mix of documents including from specialty societies (e.g. American Academy of Orthopaedic Surgeons, American College of Radiology, British Elbow & Shoulder Society), from healthcare providers (e.g. NHS England, the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration), and from groups of or from associations advising on issues related to workers compensation (e.g. Washington State Department of Labor and Industries, AIM Specialty Health).

Due to local interest, a position statement from the Australian Orthopaedic Association and Shoulder and Elbow Society of Australia was included. Although not a guideline, it provides the perspective of surgeons in Australia and New Zealand regarding the use of subacromial decompression. This document was not critically appraised but the advice is noted.

Some documents had a broad intended audience, while others were focused on certain aspects of clinical care such as radiology and imaging (American College of Radiology, Society of Radiographers and British Medical Ultrasound Society), primary care (Eubank 2021, Hopman 2013), physiotherapy (NHS England 2013) or surgery (Academy of Medical Royal Colleges, American Academy of Orthopaedic Surgeons).

Most documents provided guidance on broad indications such as shoulder pain or injury, rotator cuff syndrome or joint surgery. A small number of guidelines were focused on a very particular aspect of shoulder pain or intervention:

- Subacromial shoulder pain (British Elbow & Shoulder Society, 2014, Dierks 2014) for pure subacromial impingement (Academy of Medical Royal Colleges, NICE 2018)
- Subacromial decompression (Hohmann 2020, Vandvik 2019)
- Shoulder impingement syndrome (NHS England 2013)

All guidelines were evidence-based, although the rigour of this approach varied from explicit and high-quality systematic review (Vandvik 2019, AAOS 2019) to unclear methods and evidence-base (Juel 2019, New York State Workers Compensation Board, 2021). The majority of guidelines indicated some type of literature review, with no formal evidence synthesis, but with supporting references provided, frequently described in terms of the quality of the evidence.

Due to the focus of this review on MBS services related to subacromial decompression, guidelines which provided detail regarding to the use of surgery for rotator cuff disease were appraised for quality using the AGREE II tool (Appendix C). As there was no opportunity to pre-define relevant domains or to identify specific thresholds of quality, these results are described narratively. No guidelines were excluded. Three guidelines were deemed to be of better quality (AAOS 2019, Hopman 2013, Vandvik, 2019). Other guidelines were of moderate quality (BOA/BESS 2014, Colorado 2015, Dierks 2014, NICE 2018). Many guidelines scored poorly in terms of their methods, while other aspects appeared appropriate.

It should be noted that the most relevant guideline was not always easily identified. For example, at the time of the systematic search, AIM Specialty Health had two separate guidelines (ratified in January 2021 and published in March 2021) that differed in their conclusions for the use of subacromial decompression (AIM 2018, AIM 2021). As of 23 February 2022, only one guideline was available which recommended against the use of this procedure. In addition, the Dutch Orthopaedic Society published an earlier guideline (Dierks 2014) and also funded the development of a later guideline which did not recommend the use of subacromial decompression surgery for patients with subacromial pain syndrome or rotator cuff disease (Vandvik 2019). It is uncertain if the cautious but less explicit earlier guideline is superseded. The guideline published on the Academy of Medical Royal Colleges website is the same as included in the NHS England clinical commissioning guidelines (AMRC 2018, NICE 2018).

Recommendations: Initial diagnosis

There was consensus across all guidelines for the use of history and physical examination for patients with shoulder pain or a suspected rotator cuff injury. Information provided varied across documents. The greatest detail is provided in two guidelines (Eubank et al. 2021, Kassolik et al. 2018).

Clinical history should include course of the disease, history of injuries, dominant side, pain location, direction of movement that provokes pain, character of pain, type of work, effect of pain on sleep, and coexisting diseases (Kassolik et al. 2018).

Physical examination should include inspection of the upper torso and shoulders looking for atrophy and abnormalities, together with observation of posture and scapular positioning. Shoulder pain emanating

from cervical spinal pathology should be ruled out. Active and passive range-of-motion and strength testing should be performed bilaterally. Scapulohumeral rhythm should be assessed for scapular dyskinesis (Eubank et al. 2021).

A combination of physical tests and manoeuvres are recommended (Eubank et al. 2021). For example, for subacromial impingement, a combination of the Hawkins-Kennedy test, the painful arc test (with pain occurring between 60° and 120°), and the infraspinatus muscle strength test; and for a rotator cuff tear, the painful arc sign, drop-arm test, and the infraspinatus and supraspinatus muscle strength tests should be used (Colorado Department of Labor and Employment 2015, Diercks et al. 2014, Hopman et al. 2013).

Recommendations: Primary care

Medical therapy

Medical therapies such as nonsteroidal anti-inflammatory drugs (NSAIDs) and analgesics are recommended or may be considered based on nine clinical practice guidelines (CPGs) (AOA 2017, Colorado Department of Labor and Employment 2015, Diercks et al. 2014, Hopman et al. 2013, Juel et al. 2019, Kauta et al. 2021, New York Workers Compensation Board 2021, Oliva et al. 2015, Washington State Department of Labor and Industries 2018). Analgesic medication such as paracetamol, aspirin or ibuprofen is prescribed as the initial medication for mild to moderate pain. NSAIDs may be given to patients with acute shoulder pain or severe pain that impedes activity. For patients with spontaneous shoulder pain which includes subacromial impingement, chronic rotator cuff tear and calcific tendonitis, a 3-month course of analgesic and anti-inflammatory drugs with physiotherapy is recommended by 1 CPG (Kauta et al. 2021).

Physical therapy

Seventeen CPGs recommended physiotherapy for patients with shoulder pain (AAOS 2019, AIM 2018, AIM 2021, AMRC 2018, BOA 2014, Colorado Department of Labor and Employment 2015, Diercks et al. 2014, Eubank et al. 2021, Hopman et al. 2013, Industrial Insurance Chiropractic Advisory Committee 2014, Juel et al. 2019, Kassolik et al. 2018, New York Workers Compensation Board 2021, NHS 2013, NICE 2018, Oliva et al. 2015, Washington State Department of Labor and Industries 2018, Yu et al. 2021).

Exercise therapy is usually given with and can be a part of the physiotherapy intervention. There is good to strong evidence on the benefit of exercise therapy and physiotherapy in managing shoulder pain for 5 - 12 weeks. However, exercise parameters (frequency and intensity) were not explicitly stated in the guidelines (Colorado Department of Labor and Employment 2015, Eubank et al. 2021, Juel et al. 2019, NHS 2013, Rees et al. 2021). Specific exercises indicated for shoulder pathology includes postural correction and scapula-setting exercises, shoulder stretches and range-of-movement exercises (especially posterior capsule/cuff mobility), weight-bearing exercises, specific strengthening within normal movement patterns, core stability exercises, graded return to sport/normal function and plyometrics (NHS 2013, Yu et al. 2021).

The guidelines reported different recommendations on manual therapy. According to the Industrial Insurance Chiropractic Advisory Committee of the Washington State Department of Labor and Industries, there is limited evidence to support a combined manual approach of mobilisation/manipulation, active/passive exercise and soft-tissue techniques for most mechanical shoulder conditions (Industrial Insurance Chiropractic Advisory Committee 2014). Three guidelines recommended manual therapy for patients with shoulder pain (Colorado Department of Labor and Employment 2015, Eubank et al. 2021, Yu et al. 2021).

Inconclusive therapies reported by two guidelines included massage, motor therapy, laser therapy, therapeutic ultrasound, transcutaneous electrical nerve stimulation and pulsed electromagnetic field therapy (Kassolik et al. 2018, Yu et al. 2021).

Injections

There are conflicting levels of recommendations (weak to strong) from nine guidelines on the use of corticosteroid injections for shoulder pain (AAOS 2019, Colorado Department of Labor and Employment 2015, Diercks et al. 2014, Eubank et al. 2021, Juel et al. 2019, New York Workers Compensation Board 2021, Oliva et al. 2015, Washington State Department of Labor and Industries 2018, Rees et al. 2021). Corticosteroid injections are more effective than NSAIDs in reducing pain in the short term. One guideline recommended the use of corticosteroids for severe pain under ultrasound guidance in the first 8 weeks (Diercks et al. 2014). The other guidelines only mentioned that injection is recommended or can be considered. No more than 2 to 3 corticosteroid injections should be given to the patient, since the treatment is associated with side effects such as weakening of the connective tissue or tendon damage (Eubank et al. 2021, New York Workers Compensation Board 2021, Washington State Department of Labor and Industries 2018, Rees et al. 2021). One guideline did not recommend repeated injections (Juel et al. 2019). There is conflicting evidence from two guidelines on the use of ultrasound guidance for subacromial injections (Diercks et al. 2014, Rees et al. 2021).

There is limited evidence on the use of hyaluronic acid or platelet-rich plasma injection on shoulder pain (AAOS 2019, Colorado Department of Labor and Employment 2015). Ultrasound-guided platelet-rich plasma injections in patients with arthroscopically repaired rotator cuff tears is not recommended (Sconfienza et al. 2020).

Other

Other interventions that are recommended include smoking cessation and pressure wave treatment for subacromial pain with soft-tissue limescale over 5 mm where other treatment has not been successful (Colorado Department of Labor and Employment 2015, Juel et al. 2019). High-energy extracorporeal shockwave therapy can be considered for subacromial calcium deposits (Diercks et al. 2014). A combination of counselling for an anti-inflammatory diet, acupuncture and Phlogenzym (an anti-inflammatory hydrolytic enzyme) may benefit patients with rotator cuff tendinitis (Industrial Insurance Chiropractic Advisory Committee 2014).

There is limited evidence on the use of acupuncture for shoulder conditions (Industrial Insurance Chiropractic Advisory Committee 2014). Pressure wave therapy and laser therapy are not recommended for non-specific shoulder pain or subacromial pain without soft-tissue limescale (Colorado Department of Labor and Employment 2015, Juel et al. 2019).

Recommendations: Radiology and imaging

X-ray

Nineteen guidelines recommend X-ray, including as an initial test (ACR 2021, ACR 2017, ACR 2018, BOA 2014, Colorado Department of Labor and Employment 2015, Rees et al. 2021, Eubank et al. 2021). Radiology can be used for symptomatic atraumatic or traumatic injury and for pain after repair or arthroplasty (ACR 2021, ACR 2017, ACR 2018).

Two guidelines are explicit regarding the timing, in that radiology should not be routinely performed for most non-traumatic diagnoses (Colorado Department of Labor and Employment 2015), should not be used within the first four to six weeks in the absence of 'red flags' (Hopman et al. 2013) but should be used when patients do not improve with conservative treatments (Rees et al. 2021). Guidelines also recommend the use of imaging to exclude other causes or in selected patients as clinically indicated (Colorado

Department of Labor and Employment 2015, New York Workers Compensation Board 2021, Oliva et al. 2015, Industrial Insurance Chiropractic Advisory Committee 2014, Juel et al. 2019).

Some guidelines are explicit in the benefits of radiology to determine fractures, osteoarthritis, bone abnormalities, calcium deposits or mechanical impingement (ACR 2021, ACR 2017, ACR 2018, Diercks et al. 2014, Hohmann et al. 2020, New York Workers Compensation Board 2021, Industrial Insurance Chiropractic Advisory Committee 2014).

Ultrasound

Sixteen guidelines report ultrasound as beneficial for rotator cuff disease. Many guidelines simply describe ultrasound as a suitable test, as adjunct to clinical exam, to identify and quantify rotator cuff injury (AAOS 2019, Hohmann et al. 2020, Industrial Insurance Chiropractic Advisory Committee 2014, Klauser et al. 2012, Oliva et al. 2015, Society of Radiographers 2021, Washington State Department of Labor and Industries 2021, Juel et al. 2019).

Some guidelines are clearer on the timing of the use of ultrasound and its place in clinical care. Ultrasound is not appropriate for initial imaging but is suitable only when initial radiographs are negative or inconclusive, with physical findings consistent with rotator cuff tear (ACR 2021, ACR 2017, ACR 2018), or in secondary care to assess the integrity and state of rotator cuff muscles and tendons (BOA 2014).

Certain guidelines are explicit that ultrasound is indicated only if the initial period of non-operative treatment fails, at 4 to 6 weeks (Colorado Department of Labor and Employment 2015, Diercks et al. 2014, Hopman et al. 2013, Industrial Insurance Chiropractic Advisory Committee 2014, New York Workers Compensation Board 2021), including only where clinically indicated and for surgical candidates (Colorado Department of Labor and Employment 2015, Industrial Insurance Chiropractic Advisory Committee 2014, New York Workers Compensation Board 2021).

For subacromial pain, one guideline recommends against shoulder ultrasound or magnetic resonance imaging (MRI) unless an agreed specific treatment pathway exists with the local specialist shoulder service (Rees et al. 2021).

Magnetic resonance imaging

MRI (without contrast) is recommended by seventeen guidelines for rotator cuff disease. Some guidelines simply describe MRI as a suitable test as an adjunct to a clinical exam (AAOS 2019), although more beneficial for a high degree or complete rotator cuff tear (Hohmann et al. 2020, Juel et al. 2019), and limited for PTT (Oliva et al. 2015). MRI is to be used in patients indicated for surgery and is recommended when US is inconclusive or unavailable (Colorado Department of Labor and Employment 2015, Diercks et al. 2014), although in one guideline ultrasound is preferred over MRI for large rotator cuff tears (Industrial Insurance Chiropractic Advisory Committee 2014).

In terms of timing, MRI is not recommended for initial imaging, and only after radiography when these are inconclusive or negative and where there is suspected rotator cuff tear (ACR 2021, ACR 2017, ACR 2018). MRI is recommended in secondary care, if appropriate, to assess the integrity and state of rotator cuff muscles and tendons (BOA 2014), or when patients are unresponsive to conventional care (Industrial Insurance Chiropractic Advisory Committee 2014). Two guidelines recommend that MRI should not be used in primary care (Eubank et al. 2021, Rees et al. 2021).

Certain guidelines are more specific on the use of MRI, recommending it for patients who have experienced significant activity restriction and pain for four to six weeks following initiation of an active, non-surgical treatment program and have had no response to the treatment program (Colorado Department of Labor and Employment 2015, Hopman et al. 2013, New York Workers Compensation Board

2021). Referral to MRI can be considered sooner (1 to 2 weeks) if there is clinical suspicion of FTT (New York Workers Compensation Board 2021).

For suspected impingement, MRI reveals evidence of tendinopathy/tendinitis or a rotator cuff tear (Washington State Department of Labor and Industries 2018). MRI may only be warranted for impingement syndrome if improvement is not evident with an adequate trial of conservative care (Industrial Insurance Chiropractic Advisory Committee 2014).

Other

Guidelines mention other imaging modalities as appropriate options for suspected rotator cuff disorders including medical resonance arthrography (AAOS 2019, ACR 2021, ACR 2017, ACR 2018, Colorado Department of Labor and Employment 2015, New York Workers Compensation Board 2021, Oliva et al. 2015), X-ray arthrography or CT arthrography (ACR 2021, ACR 2017, ACR 2018, Washington State Department of Labor and Industries 2018).

There are no existing MBS items for these services.

CT (with or without contrast) is not recommended (MBS items 56627 and 56628) (ACR 2021, ACR 2017, ACR 2018).

Recommendations: Surgical care

Previous care required

Conservative therapy (physiotherapy or conservative management) prior to surgery is a recommendation of all guidelines. For rotator cuff surgery, the necessary duration of treatment is 6 to 12 weeks (AIM 2018, AIM 2021, BOA 2014, Colorado Department of Labor and Employment 2015, Washington State Department of Labor and Industries 2018), up to 6 months in one example (New York Workers Compensation Board 2021). Where described for subacromial decompression, conservative therapy is required for at least 6 weeks (Colorado Department of Labor and Employment 2015, Diercks et al. 2014, Hohmann et al. 2020, New York Workers Compensation Board 2021, NICE 2018, Washington State Department of Labor and Industries 2018) and up to 6 months (AIM 2018, Colorado Department of Labor and Employment 2015).

Conservative therapy is not a requirement for FTT in two guidelines (New York Workers Compensation Board 2021, Washington State Department of Labor and Industries 2018).

Prior conservative care and physiotherapy was a recommendation of all of the higher quality CPGs (AAOS 2019, Hopman et al. 2013, Vandvik et al. 2019).

Rotator cuff repair

All guidelines that report the use of surgical repair recommend it as an option for certain rotator cuff tears, although guidelines are varied in the selection and description of the indicated populations.

Two guidelines recommend that surgery should be considered for rotator cuff tears but do not provide explicit criteria (AAOS 2019, Diercks et al. 2014). Three guidelines recommend surgical repair for any symptomatic FTT and do not distinguish between acute or chronic tears (BOA 2014, Colorado Department of Labor and Employment 2015, New York Workers Compensation Board 2021).

Where reported, surgery is recommended for acute FTT following a review of pain, weakness, physical examination and imaging, with or without X-ray (AIM 2021, Washington State Department of Labor and Industries 2018, Hopman et al. 2013). In two guidelines for chronic FTT, surgery may be considered with

similar criteria to acute FTT but with the addition of failure of at least 6 weeks conservative therapy (AIM 2021, Washington State Department of Labor and Industries 2018).

Debridement or repair is an option for PTT (AAOS 2019, New York Workers Compensation Board 2021), including for PTT involving less than 50% tendon thickness (Hohmann et al. 2020, Oliva et al. 2015).

For PTT repair, patient selection for surgery is generally based on presentation including pain, weakness, exam, imaging, and failure of conservative therapy (AIM 2018, AIM 2021, New York Workers Compensation Board 2021, Washington State Department of Labor and Industries 2018). Certain guidelines recommend that with PTT of less than 50% thickness an additional 6 weeks conservative therapy is required prior to considering surgery (Hohmann et al. 2020, Washington State Department of Labor and Industries 2018). One guideline considers surgical repair to be an option where there has been no improvement in function after 6 to 12 weeks (Colorado Department of Labor and Employment 2015).

Where reported, guidelines consider no long-term difference between arthroscopic and open approaches for surgery (AAOS 2019, Colorado Department of Labor and Employment 2015, Industrial Insurance Chiropractic Advisory Committee 2014).

Two of the better quality CPGs provide recommendations on rotator cuff repair (AAOS 2019, Hopman et al. 2013). In one, surgical repair is an option for patients with FTT following non-surgical therapy and review (Hopman et al. 2013). The second CPG recognised that both physical therapy and surgical repair lead to significant improvements; that strong evidence supports repair in patients that failed conservative management with high-grade PTT; and that there was a consensus recommendation for the choice of debridement versus repair of high-grade PTT for patients that have failed physical therapy (AAOS 2019).

Subacromial decompression concomitant with rotator cuff repair

Published guidelines are varied in their recommendations for the use of subacromial decompression as a part of rotator cuff repair, and many do not provide explicit recommendations for this indication.

One CPG states subacromial decompression can be used if indicated, but specific criteria are not provided for patient selection (BOA 2014). Three CPGs are unclear about the concomitant use of decompression and repair of the rotator cuff (Diercks et al. 2014, Hohmann et al. 2020, Vandvik et al. 2019).

In many CPGs subacromial decompression is explicitly excluded (AIM 2021, Vandvik et al. 2019), not always necessary (Colorado Department of Labor and Employment 2015, Washington State Department of Labor and Industries 2018) or not for routine use with small to medium sized FTT (AAOS 2019).

For specific procedures, in two guidelines the procedure of acromioplasty is not always or usually necessary (Colorado Department of Labor and Employment 2015, Washington State Department of Labor and Industries 2018), coplaning is acceptable during rotator cuff repair, tenodesis, distal clavicular resection and resection of the coracoacromial ligament are not recommended (Colorado Department of Labor and Employment 2015).

Of the two better quality CPGs that reported on this indication, the use of acromioplasty for patients with small to medium sized full-thickness rotator cuff tears was not supported (AAOS 2019), or was not recommended for patients with subacromial pain syndrome or rotator cuff disease (Vandvik et al. 2019).

Subacromial decompression (standalone)

Standalone subacromial decompression is not indicated in two guidelines (AIM 2021, Vandvik et al. 2019). It is not medically necessary for all indications including subacromial impingement syndrome (AIM 2021), and for subacromial pain syndrome, or rotator cuff disease (Vandvik et al. 2019).

Other guidelines indicate that the procedure may be considered when specified conditions are met, specifically with ongoing pain and positive appropriate physical examinations despite 6 weeks to 6 months conservative management (Hohmann et al. 2020, New York Workers Compensation Board 2021, Washington State Department of Labor and Industries 2018), with or without imaging (Hohmann et al. 2020, New York Workers Compensation Board 2021, Washington State Department of Labor and Industries 2018). Two guidelines include the requirement to have proven pain relief with a subacromial injection of a local anaesthetic (New York Workers Compensation Board 2021, Washington State Department of Labor and Industries 2018).

Other guidelines describe patient selection based on patient presentation, where subacromial decompression is indicated for certain cases in patients with pure (AMRC 2018, NICE 2018) subacromial impingement who have significant symptoms (AOA 2017) despite non-operative therapy (AMRC 2018, AOA 2017, BOA 2014, Colorado Department of Labor and Employment 2015, Diercks et al. 2014, NICE 2018). These guidelines are generally more explicit on subacromial impingement as being the relevant indication for surgery.

Most guidelines do not describe the procedure. Three guidelines are more explicit, recommending bursectomy (Diercks et al. 2014) but not acromioplasty or coraco-acromial release (Colorado Department of Labor and Employment 2015). One guideline is explicit that the procedure is acromioplasty (New York Workers Compensation Board 2021).

One guideline includes subacromial decompression as an option for impingement pain for patients with an irreparable rotator cuff tear (BOA 2014).

Only one of the three better guidelines comment on the use of subacromial decompression as a standalone procedure and recommends that surgery should not be used (Vandvik et al. 2019). However, it should be noted that the population in this guideline and the systematic review on which it was based included patients with subacromial pain syndrome, or rotator cuff disease. This may represent a broader patient cohort some of whom may benefit from other surgery such as rotator cuff repair. The majority of guidelines that allow for the use of subacromial decompression define their patients both in terms of failure of previous conservative therapy and identified as having subacromial impingement through physical tests and X-ray or imaging.

Other surgery

Reverse shoulder arthroplasty is recommended; for example, in patients with severe osteoarthritis or massive rotator cuff tears (AIM 2018, AIM 2021, Colorado Department of Labor and Employment 2015, Washington State Department of Labor and Industries 2018). Indications for revision rotator cuff surgery are also described in some guidelines (AIM 2018, AIM 2021, Washington State Department of Labor and Industries 2018).

Alignment of international and Australian clinical practice guidelines

Two Australian documents were identified: a CPG by Hopman and colleagues, describing the management of rotator cuff syndrome in the workplace with a focus on primary and intermediate care, and a position statement published by the Shoulder and Elbow Society of Australia and AOA (AOA 2017, Hopman et al. 2013). Both these documents are broadly in line with many of the more detailed international guidelines and taken together provide advice on the entirety of the care pathway.

The guideline does align closely with international guidelines in terms of diagnosis, initial treatment and the approach to radiology and imaging (Hopman et al. 2013). Specifically, diagnosis is primarily

recommended through history taking, physical examination and tests. X-rays and imaging are discouraged, unless there are 'red flags' which suggest serious pathology. Pain relief, lifestyle, return-to-work measures, physiotherapy and rehabilitation are described. In line with many guidelines, patient progress is reviewed at 4 to 6 weeks.

If symptoms are not resolved, X-ray or imaging can be considered. For a FTT, surgery can be considered. For a non-FTT (including subacromial impingement), a subacromial injection of steroid can be considered, followed by a repeat of non-operative care. Specialist opinion, including surgery, can be considered for patients where symptoms are not resolved for a further 3 months.

The guideline does not provide recommendations on patient selection for surgery.

The position statement was published in response to a recent randomised controlled trial (RCT) and provides narrative on this trial and its applicability to usual care (AOA 2017). It also provides the AOA's opinion on patient selection for subacromial decompression which should only be performed for symptoms that are significant and persistent, and that have not responded to non-operative care, including injections and physiotherapy. This is in line with many international guidelines.

Neither of these documents provide detailed recommendations on selection of patients for rotator cuff repair (FTT or PTT), or specific characteristics of patients who may particularly benefit from standalone or concurrent subacromial decompression. Specific procedures are not described.

One additional document describes the management of rotator cuff disease in the Australian setting, but is described as an evidence review rather than a guideline and therefore was not included in this analysis (Whittle and Buchbinder 2015).

It is uncertain which, if any, of the more recent guidelines are commonly used to inform patient care in Australia, whether for primary, intermediate or surgical care. It is also noted that the management of shoulder pain in primary care in Australia is varied, therefore the alignment of clinical and surgical practice to existing clinical practice guidelines is uncertain (Buchbinder et al. 2013).

Alignment of the clinical practice guidelines with current and proposed MBS items

The wording of the current and proposed MBS items do not describe any required care pathway; instead, the selection of patients for surgery is at clinical discretion:

- The items do not define a population.
- The items are not explicit regarding previous tests or therapies.
- The items include a mix of surgical interventions that relate to various pathological indications.

Questions for consultation

Please note that this current report has involved no formal analysis of clinical evidence. The assessment report will be a separate exercise, following this consultation phase and after the PICO Confirmation has been confirmed with PASC. Please also note, consultation input is not limited to these questions and can be received upon any aspect of the clinical guidelines review (and Draft PICO confirmation).

Proposed questions for consultation and stakeholder input:

1. Are there any relevant guidelines that should be added to the draft report?
2. What guidelines are commonly used for rotator cuff injuries in Australia?

3. In primary care, what, if any, radiology or imaging is commonly used for suspected rotator cuff injury?
4. In primary care, what are the common treatments? Are most patients with suspected degenerative rotator cuff injury provided with a formal program of conservative therapy?
 - a. For patients with subacromial impingement is the minimum duration of 5-12 weeks appropriate for conservative therapy to be provided prior to referral to be considered for surgery?
 - b. For patients with (suspected) rotator cuff tears (excepting traumatic aetiology), is the minimum duration of 5-12 weeks appropriate for conservative therapy to be provided prior to referral to be considered for surgery?
5. Prior to surgery, what tests and imaging are used to determine the nature of the injury?
6. How are patients selected for surgery for:
 - a. subacromial impingement alone?
 - b. rotator cuff tear and subacromial impingement, or
 - c. rotator cuff tear alone?
7. What are the common surgical interventions used in Australia for:
 - a. rotator cuff repair?
 - b. subacromial decompression?

Next steps

Following public consultation this draft report will be revised. Relevant feedback will be used to advise the PICO Confirmation and Department Contracted Assessment Report.

Appendix A MBS items

Table 1 Existing MBS items, MBS Review Task force recommendations and proposed new items

	Recommendation 74	Recommendation 75	Subsequent addition to Taskforce recommendations
Consolidate	48900 SHOULDER, excision of coraco-acromial ligament or removal of calcium deposit from cuff or both. (Anaes.) (Assist.)	48906 SHOULDER, repair of rotator cuff, including excision of coraco-acromial ligament or removal of calcium deposit from cuff, or both – not being a service associated with a service to which item 48900 applies (Anaes.) (Assist.)	
	48903 SHOULDER, decompression of subacromial space by acromioplasty, excision of coraco-acromial ligament and distal clavicle, or any combination. (Anaes.) (Assist.)	48909 SHOULDER, repair of rotator cuff, including decompression of subacromial space by acromioplasty, excision of coraco-acromial ligament and distal clavicle, or any combination – not being a service associated with a service to which item 48903 applies. (Anaes.) (Assist.)	
	48951 SHOULDER, arthroscopic division of coraco-acromial ligament including acromioplasty – not being a service associated with any other arthroscopic procedure of the shoulder region. (Anaes.) (Assist.)	48960 SHOULDER, reconstruction or repair of, including repair of rotator cuff by arthroscopic, arthroscopic assisted or mini open means; arthroscopic acromioplasty; or resection of acromioclavicular joint by separate approach when performed – not being a service associated with any other procedure of the shoulder region. (Anaes.) (Assist.)	
New Items	489XX Open or arthroscopic subacromial decompression of Shoulder. Inclusive of, if performed: i) coraco-acromial ligament division ii) acromioplasty iii) excision of outer clavicle and acromioclavicular joint iv) removal of calcium deposit v) excision of bursa – not being a service associated with a service to which any open or arthroscopic shoulder region procedure applies. (Anaes.) (Assist.)	489XY Open, arthroscopic, arthroscopic assisted or mini open repair of rotator cuff of Shoulder. Inclusive of, if performed: i) decompression of subacromial space by acromioplasty ii) excision of coraco-acromial ligament, distal clavicle and acromioclavicular joint. iii) excision of the bursa iv) biceps tenodesis – not being a service associated with a service to which any open or arthroscopic shoulder region procedure applies (Anaes.) (Assist.)	489XY(2) Open, arthroscopic, arthroscopic assisted or mini open repair of rotator cuff of Shoulder, for a tear greater than or equal to 3 cm as assessed on ultrasound, MRI or arthroscopically measured. Inclusive of, if performed: i) decompression of subacromial space by acromioplasty ii) excision of coraco-acromial ligament, distal clavicle and acromioclavicular joint. iii) excision of the bursa iv) biceps tenodesis – not being a service associated with a service to which any open or arthroscopic shoulder region procedure applies (Anaes.) (Assist.)

Appendix B Literature search and identification methods

A systematic literature review was performed to identify relevant guidance documents. The literature searches were based on a recent systematic review (Doiron-Cadrin et al. 2020). The website searches were taken from a published health technology assessment (Moshi et al. 2021).

Table 2 Search methods

Limit	Eligibility criteria
Databases searched	OVID Medline OVID Embase
Search terms	<ol style="list-style-type: none"> 1 guideline*.ti,ab. 2 shoulder.ti,ab. 3 "rotator cuff".ti,ab. 4 "shoulder tendinopathy".ti,ab. 5 "subacromial decompression".ti,ab. 6 2 or 3 or 4 or 5 7 1 and 6 8 Limited to past 5 years <p>Searched 19 January 2022</p>
Other guidance-specific databases and websites searched	<ul style="list-style-type: none"> • Guidelines International Network (GIN) https://www.g-i-n.net/library/international-guidelines-library • Association of the Scientific Medical Societies (AWMF) https://www.awmf.org/awmf-online-das-portal-der-wissenschaftlichen-medizin/awmf-aktuell.html • National Guideline Clearinghouse https://www.ahrq.gov/gam/index.html • Scottish Intercollegiate Guidelines Network https://www.sign.ac.uk/ • TRIP database http://www.tripdatabase.com/ • National Institute for Health and Care Excellence (NICE) website www.evidence.nhs.uk/ • Canadian Medical Association Clinical Practice Guidelines https://joulecma.ca/ • National Health and Medical Research Council Australian Clinical Practice Guidelines https://www.clinicalguidelines.gov.au/ • Guidelines, summarising clinical guidelines for primary care https://www.guidelines.co.uk/ <p>Search terms included: shoulder; subacromial; rotator cuff</p>
Search period	<p>Last 5 years</p> <p>Older clinical practice guidelines were identified through three recent systematic reviews (Barrett et al. 2021, Doiron-Cadrin et al. 2020, Moshi et al. 2021)</p>

Website searches

The Google advanced search engine was used to search selected College and specialty society websites. The following websites were searched in Google for publicly available documents.

For example, site: <https://website.org> followed by:

- guideline
- guideline shoulder
- guideline subacromial
- guideline rotator
- statement
- statement shoulder
- statement subacromial
- statement rotator.

Table 3 Specialty websites

Specialty association	Website
Geneva Medical Association	https://www.amge.ch/
American Association for the Surgery of Trauma	https://www.aast.org/Default.aspx
American Academy of Orthopaedic Surgeons	http://www.aaos.org/
American College of Sports Medicine	https://www.acsm.org/
American College of Surgeons	http://www.facs.org/
American Orthopaedic Association	https://www.aoassn.org/
American Orthopaedic Society for Sports Medicine	https://www.sportsmed.org/aossmimis
American Shoulder and Elbow Surgeons	https://www.ases-assn.org/
American Sports Medicine Institute	http://www.asmi.org/
Arbeitsgemeinschaft für Osteosynthesefragen (AO Foundation)	http://www.aofoundation.org/
Russian Scientific Research Institute of Traumatology and Orthopedics	http://www.rniito.org/
Association of Surgeons of Great Britain and Ireland	http://www.asgbi.org.uk/
Australian Orthopaedic Association	https://www.aoa.org.au/
Australian Specialty Orthopaedic Meetings	https://aoa.org.au/events/key-aoa-events
Austrian Orthopaedic Association	http://www.orthopaedics.or.at/
Austrian Orthopaedic Society	http://www.unfallchirurgen.at/index.php

Specialty association	Website
Arbeitsgemeinschaft wissenschaftlicher Fachgesellschaften (Association of the Scientific Medical Societies)	https://www.awmf.org
Belgian Orthopaedic and Trauma Society	http://www.bvot.be/index.php
British Association of Sports & Exercise Medicine	http://www.basem.co.uk/
British Elbow and Shoulder Society	http://www.bess.org.uk/
British Orthopaedic Association	http://www.boa.ac.uk/
British Orthopaedic Research Society	http://www.borsoc.org.uk/
British Orthopaedic Specialists Society	https://www.omicsonline.org/societies/british-orthopaedic-specialists-society/
British Orthopaedic Sports Trauma and Arthroscopy Association	http://www.bosta.ac.uk/
British Trauma Society	http://www.bts-org.co.uk/
Bulgarian Orthopedic and Traumatology Association (BOTA)	https://www.bulortho.org/en/
Canadian Orthopaedic Association	http://www.coa-aco.org/
International Combined Orthopaedic Research Societies	https://i-cors.org/
Dansk Ortopaedisk Selskab (DOS) – Denmark	https://www.ortopaedi.dk/
Dutch Orthopaedic Association	http://www.orthopeden.org/
Dutch Association for Trauma Surgery	http://www.trauma.nl/
Eastern Orthopaedic Association	http://eoa-assn.org/
European Federation of National Associations of Orthopaedics and Traumatology	https://www.efort.org/
European Federation of Societies for Microsurgery	http://www.efsm.eu/ (unavailable)
European Orthopaedic Research Society	https://www.eors.info/
European Society for Movement Analysis in Adults and Children	http://www.esmac.org/
European Society for Surgery of Shoulder and Elbow	https://www.eusser.org/
European Society for Trauma and Emergency Surgery	http://www.estesonline.org/

Specialty association	Website
Finnish Orthopaedic Association	http://www.soy.fi/
German Society for Orthopaedics and Trauma	https://dgou.de/en/home/
German Orthopaedic Society	http://www.bvou.net/fe/index.php
Greek Orthopaedic Association	http://www.eexot.gr/
Hungarian Orthopaedic Association	http://www.ortopedtarsasag.hu/
Icelandic Medical Association	http://www.lis.is/
International Congress on Shoulder and Elbow Surgery	http://www.icses.org/ (unavailable)
International Federation of Sports Medicine	https://www.fims.org/
International Society of Orthopaedic Surgery and Traumatology (Belgian)	http://www.sicot.org/
International Society of Physical and Rehabilitation Medicine	http://www.isprm.org/
International Sports Medicine Science and Performance	http://www.leedsmet.ac.uk/conferences/sportsmedicine/index_conference_details.htm (unavailable)
Internet Society of Orthopaedic Surgery and Trauma	http://www.isost.net/
Irish Orthopaedic Association	http://www.ioa.ie/
Mid-America Orthopaedic Association	http://www.maoa.org/
National Association of Orthopaedic Technologists	http://www.naot.org/
New Zealand Orthopaedic Association	http://www.nzoa.org.nz/
Nordic Orthopaedic Federation	http://www.norf.org/
Norwegian Medical Association	https://beta.legeforeningen.no/om-oss/english/
Orthopaedic Research and Education Foundation	https://www.oref.org/
Orthopaedic Research Society	https://www.ors.org/
Orthopaedic Trauma Association	https://ota.org/
Polish Orthopaedic Society	http://www.ortopedia.biz.pl/ (unavailable)
Romanian Orthopaedic Association	http://www.sorot.ro/
Ruth Jackson Orthopaedic Society	http://www.rjos.org/

Specialty association	Website
Societa Italiana di Ortopedia e Traumatologia	http://www.siot.it
Society of Orthopaedics and Traumatology of the East	http://www.sotest.org/
Société Française de Chirurgie Orthopédique et Traumatologique	http://www.sofcot.fr/
Society of Military Orthopaedic Surgeons	https://www.somos.org/
Southern Orthopaedic Association	http://soaassn.org/
The Spanish Society of Orthopedic Surgery and Traumatology	http://www.secot.es/
Sports and Exercise Medicine UK	http://www.uksem.org/
Faculty of sports and exercise medicine UK	https://www.fsem.ac.uk/
Swedish Orthopaedic Association	http://www.ortopedi.se/
Swiss Orthopaedic Association	http://www.swissorthopaedics.ch/de/
Turkish Orthopaedics and Traumatology Association	http://www.totbid.org.tr/
Vereinigung Süddeutscher Orthopäden und Unfallchirurgen/Association of South German Orthopedists and Trauma Surgeons	https://www.vsou.de
Washington State Orthopaedic Association	https://wsoa.org/
Wenckebach Instituut (Netherlands)	http://www.wenckebachinstituut.nl/documenten/algemeen/International%20conferences.htm
Western Orthopaedic Association	http://woa-assn.org/index.cfm
World Orthopaedic Concern (United Kingdom)	http://www.wocuk.org/
IOC World Conference on Prevention of Injury & Illness in Sport	https://ioc-preventionconference.org/

Study selection

All documents were imported to an EndNote bibliographic database. The following documents were eligible for inclusion.

Included:

- Study type: Studies that clearly identified as a guideline or formal statement
- Population: Relevant to shoulder indications related to the rotator cuff:
 - Patients with painful shoulder or shoulder injury
 - Patients with subacromial impingement

- Patients with rotator cuff disease or tear
- Intervention: Focused on any aspect of rotator cuff management or repair
- Systematically developed
- Available in full-text
- Available in the English language

Excluded:

- Not a clinical practice guideline
- Not current: not the most up-to-date version of a guideline or more recent guidelines exist for that region
- Wrong patient population: guidance does not relate to rotator cuff
- Not in English
- Rehabilitation post-surgery
- Patients with other pathologies of the shoulder e.g. glenohumeral joint osteoarthritis, acromioclavicular arthritis, labral tear including superior labral anterior-posterior (SLAP) tears, adhesive capsulitis/frozen shoulder, tendinopathy of the long head of the biceps, calcific tendinopathy, bicipital tendon disorders, neuropathy, bursitis, shoulder fractures, shoulder instability/dislocation, malignancy, infection

A triaged approach was taken to guideline selection. Guidelines were arranged into categories based on intervention and population/indication:

- Guidelines which include surgery for rotator cuff disease
- Diagnosis and imaging for rotator cuff disease
- Conservative therapies and primary care for rotator cuff disease

Study extraction and quality appraisal

All guidelines for rotator cuff disease were included.

- Guidelines that provided explicit recommendations on the use of surgery were identified, extracted and appraised for quality (Appendix C).
- Guidelines that did not provide explicit recommendations on the use of surgery were identified and extracted. These were not appraised for quality as they do not provide evidence related to the current and proposed MBS services. These guidelines include those focused on imaging and primary care.

After exclusion of duplicate references, total of 1,257 documents were identified. Twenty nine guideline documents discussed the management of rotator cuff disease.

Data were extracted to standardised tables. The evidence was summarised with a thematic approach.

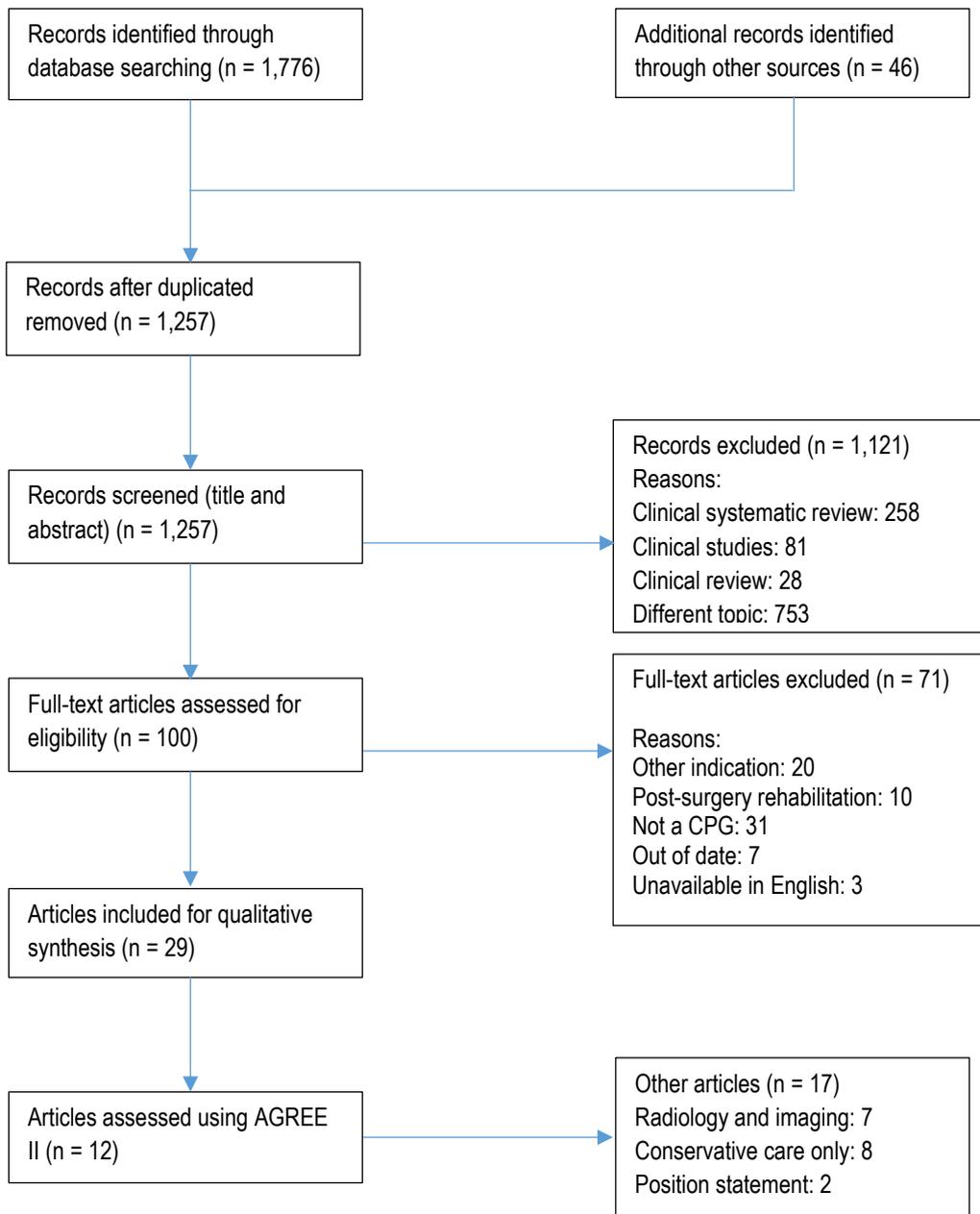


Figure 1 PRISMA flow diagram

Appendix C Critical appraisal

The methodological quality of the clinical guidelines was assessed by two independent reviewers based on the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument (AGREE Trust 2022, Brouwers et al. 2016). The instrument was developed to assess the methodological rigour and transparency of the guidelines. The AGREE II appraisal checklist includes 23 items within the following six domains: scope and purpose (3 items), stakeholder involvement (3 items), rigour of development (8 items), clarity of presentation (3 items), applicability (4 items) and editorial independence (2 items). Each item was scored using a seven-point Likert scale ranging from “strongly disagree (1 point) to “strongly agree” (7 points) (Barrett et al. 2021, Brouwers et al. 2016, Doiron-Cadrin et al. 2020). The percentage score for each domain was calculated using the formula $((\text{obtained score} - \text{minimum possible score}) / (\text{maximum possible score} - \text{minimum possible score})) * 100$.

The AGREE II instrument does not specify a minimum domain score to categorise CPGs into high or low quality, although a pre-determined cut-off score may be applied to relevant domains of the AGREE II instrument (Barrett et al. 2021, Brouwers et al. 2016). The instrument recommends identification of key domains relevant to the purpose of the research when assessing the overall quality. Based on two systematic reviews on the management of shoulder pain, after identification of relevant domains, a cut-off percentage score for each domain was determined by consensus or decisions by leadership (Barrett et al. 2021, Doiron-Cadrin et al. 2020). The determination of a specific quality threshold is not part of the current research. The calculated domain percentage scores were used to describe each guideline, to identify the strengths and limitations of the guidelines and to compare their methodological quality.

Summary of results

The results of the quality appraisal are shown in Table 4. Three of the 12 clinical practice guidelines were of better quality with a mean score of six or more in the overall guideline quality assessment (AAOS 2019, Hopman 2013, Vandvik, 2019) (average independent reviewer assessment, data not shown). 11 of the 12 guidelines (AAOS 2019, AIM 2021, BOA/BESS 2014, Colorado 2015, Diercks, Hohmann, Hopman 2013, New York 2021, NICE 2018, Vandvik 2019, Washington 2018) were recommended or recommended for use with modifications while one CPG was not recommended for use (Olivia 2015) (average independent reviewer assessment, data not shown).

A specific cut off domain percentage score was not used to categorise the included guidelines based on quality for this review. One systematic review used a cut off percentage score of at least 50% while a threshold of at least 70% was used as an example in the AGREE II instrument manual (Barrett, Bower). Using the 70% cut off point for all the domains, 3/12 CPGs (AAOS 2019, Hopman 2013, Vandvik 2019) scored $\geq 70\%$ in ≥ 4 domains. Using the 50% cut off point for all the domains, 7/12 CPGs (AAOS 2019, BOA/BESS 2014, Colorado 2015, Diercks 2014, Hopman 2013, NICE 2018, Vandvik 2019) scored $\geq 50\%$ in ≥ 4 domains with 2 CPGs scoring $\geq 50\%$ (Hopman 2013, Vandvik 2019) in all 6 domains of the AGREE II checklist.

Table 4 Summary of AGREE II domain scores and overall quality appraisal

Guideline	Domain (% score)					
	Scope and purpose	Stakeholder involvement	Rigour of development	Clarity of presentation	Applicability	Editorial independence
AAOS 2019	92	50	84	89	25	79
AIM 2021	86	33	23	86	4	29
BOA/BESS 2014	64	86	29	83	88	67
Colorado 2015	92	44	58	72	31	54
Diercks	83	69	55	92	42	17
Hohmann	58	19	14	69	15	58
Hopman 2013	92	86	89	97	56	83
New York 2021	72	36	1	78	19	21
NICE 2018	83	75	50	69	58	33
Olivia 2015	86	53	31	28	4	4
Vandvik 2019	92	67	78	81	58	96
Washington 2018	89	58	27	89	21	25

Appendix D Summary of identified guidelines

All identified clinical practice guidelines and statements related to rotator cuff disease are shown in Table 5. The recommendation of the Academy of Medical Royal Colleges is the same as published in the NHS England Evidence-Based Interventions: Guidance for Clinical Commissioning Groups (AMRC 2018, NICE 2018). The “Statement from the Shoulder and Elbow Society of Australia (an AOA subspecialty society) to the Medical Observer” is a position statement, but has been included due to local relevance (AOA 2017).

Supplementary publications not included below was a case study of the American Academy of Orthopaedic Surgeons guideline (AAOS 2019, Weber and Chahal 2021). A study of observational data in the Netherlands showed a change in diagnostic patterns and a reduction in surgery following the effect of the implementation of a multidisciplinary guideline in 2014 (Diercks et al. 2014, Veen et al. 2019).

Table 5 Overview of clinical practice guidelines

Author (reference)	Year	Title of publication	Setting	Location	Condition/ intervention	Examination	Non-operative care	Radiology and imaging	Rotator cuff repair	Subacromial decompression	Other surgery	Post-operative rehabilitation
Academy of Medical Royal Colleges (AMRC 2018)	Undated	Arthroscopic shoulder decompression for subacromial pain	Surgical care	UK	Subacromial pain	N	Y	N	N	Y	N	N
AIM Specialty Health (AIM 2021)	2021	Clinical Appropriateness Guidelines. Appropriate use criteria: Joint surgery	Surgical care	US	Joint surgery	Y	Y	N	Y	Y	Y	N
American Academy of Orthopaedic Surgeons (AAOS 2019)	2019	Management of Rotator Cuff Injuries: Evidence-Based Clinical Practice Guideline	Surgical care	US	Rotator cuff injuries	Y	Y	Y	Y	Y	Y	N
American College of Radiology (ACR 2018)	2018	ACR Appropriateness Criteria Shoulder Pain–Atraumatic	Radiology	US	Shoulder pain	N	N	Y	N	N	N	N
American College of Radiology (ACR 2017)	2017	ACR Appropriateness Criteria Shoulder Pain–Traumatic	Radiology	US	Shoulder pain	N	N	Y	N	N	N	N

Author (reference)	Year	Title of publication	Setting	Location	Condition/ intervention	Examination	Non-operative care	Radiology and imaging	Rotator cuff repair	Subacromial decompression	Other surgery	Post-operative rehabilitation
American College of Radiology (ACR 2021)	2021	ACR Appropriateness Criteria Imaging After Shoulder Arthroplasty	Radiology	US	Shoulder pain	N	N	Y	N	N	N	N
American College of Radiology (ACR 2015)	2020	ACR–SPR–SSR practice parameter for the performance and interpretation of magnetic resonance imaging (MRI) of the shoulder	Radiology	US	Shoulder	N	N	Y	N	N	N	N
Australian Orthopaedic Association (position statement) (AOA 2017)	2017	Statement from the Shoulder and Elbow Society of Australia (an AOA subspecialty society) to the Medical Observer	Surgical care	Australia and New Zealand	Subacromial decompression	N	N	N	N	Y	N	N
British Elbow & Shoulder Society (BESS) (BOA 2014)	2014	Commissioning guide: Subacromial Shoulder Pain	All care	UK	Subacromial shoulder pain	Y	Y	Y	Y	Y	Y	Y
Colorado Department of Labor and Employment (Colorado Department of Labor and Employment 2015)	2015	Shoulder Injury Medical Treatment Guidelines	All care	USA	Shoulder injury	Y	Y	Y	Y	Y	Y	Y
Dierks (Diercks et al. 2014)	2014	Guideline for diagnosis and treatment of subacromial pain syndrome: a multidisciplinary review by the Dutch Orthopaedic Association	Surgical care	Netherlands	Subacromial pain syndrome	Y	Y	Y	N	Y	N	N
Eubank et al (Eubank et al. 2021)	2021	Consensus for a primary care clinical decision-making tool for assessing,	Primary care	Canada	Shoulder pain	Y	Y	Y	Y	N	N	N

Author (reference)	Year	Title of publication	Setting	Location	Condition/ intervention	Examination	Non-operative care	Radiology and imaging	Rotator cuff repair	Subacromial decompression	Other surgery	Post-operative rehabilitation
		diagnosing and managing shoulder pain in Alberta, Canada										
Hohmann (Hohmann et al. 2020)	2020	Indications for Arthroscopic Subacromial Decompression. A Level V Evidence Clinical Guideline	Surgical care	Varied	Shoulder pain	Y	Y	Y	Y	Y	N	N
Hopman (UNSW) (Hopman et al. 2013)	2013	Clinical Practice Guidelines for the Management of Rotator Cuff Syndrome in the Workplace	Primary care	Australia	Rotator cuff syndrome	Y	Y	Y	P	P	N	P
Industrial Insurance Chiropractic Advisory Committee (Industrial Insurance Chiropractic Advisory Committee 2014)	2014	Conservative Care Options for Work-Related Mechanical Shoulder Conditions	Primary care	USA	Work-related mechanical shoulder conditions	Y	Y	Y	N	N	N	N
Juel (Juel et al. 2019)	2019	Non-traumatic shoulder pain in the primary health service	Primary care	France	Shoulder pain	Y	Y	Y	N	N	N	N
Kauta (Kauta et al. 2021)	2021	Assessment and management of shoulder pain at primary care level	Primary care	South Africa	Shoulder pain	N	Y	N	N	N	N	N
Kassolik (Kassolik et al. 2018)	2018	Recommendations of the Polish Society of Physiotherapy, Polish Society of Family Medicine and College of Family Physicians in Poland in the scope of physiotherapy in painful shoulder syndrome in primary healthcare	Primary care	Poland	Painful shoulder syndrome	N	Y	N	N	N	N	N

Author (reference)	Year	Title of publication	Setting	Location	Condition/ intervention	Examination	Non-operative care	Radiology and imaging	Rotator cuff repair	Subacromial decompression	Other surgery	Post-operative rehabilitation
Klauser (see also Sconfienza 2018) (Klauser et al. 2012, Sconfienza et al. 2018)	2021	Clinical indications for musculoskeletal ultrasound: A Delphi-based consensus paper of the European society of musculoskeletal radiology	Radiology	Europe	Shoulder	N	N	Y	N	N	N	N
New York State Workers Compensation Board (New York Workers Compensation Board 2021)	2021	Medical Treatment Guidelines Shoulder Injury	All care	US	Shoulder injury	Y	Y	Y	Y	Y	Y	Y
NHS (NHS 2013)	2013	Clinical Guideline to standardise the conservative management of shoulder impingement syndrome	Primary care	UK	Shoulder impingement syndrome	Y	Y	N	N	N	N	N
NHS England (NICE 2018)	2018	Evidence-Based Interventions: Guidance for CCGs	Surgical care	UK	Subacromial shoulder pain	N	Y	N	N	Y	N	N
Olivia (Oliva et al. 2015)	2015	Rotator Cuff Tears Guidelines	All care	Italy	Rotator cuff tears	Y	Y	Y	Y	Y	Y	Y
Rees (Rees et al. 2021)	2021	Shoulder Pain Diagnosis, Treatment and Referral Guidelines for Primary patients with rotator cuff disorders	Primary, community and Intermediate care	UK	Shoulder pain	Y	Y	Y	N	N	N	N
Sconfienza (Sconfienza et al. 2020)	2020	Clinical indications for image-guided interventional procedures in the musculoskeletal system: a Delphi-based consensus paper from the European	Radiology	Europe	Shoulder	N	Y	N	N	N	N	N

Author (reference)	Year	Title of publication	Setting	Location	Condition/ intervention	Examination	Non-operative care	Radiology and imaging	Rotator cuff repair	Subacromial decompression	Other surgery	Post-operative rehabilitation
		Society of Musculoskeletal Radiology (ESSR)—part I, shoulder										
Society of Radiographers and British Medical Ultrasound Society (Society of Radiographers 2021)	2021	Guidelines for Professional Ultrasound Practice	Radiology	UK	Ultrasound practice	N	N	Y	N	N	N	N
Vandvik (Vandvik et al. 2019)	2019	Subacromial decompression surgery for adults with shoulder pain: a clinical practice guideline	Surgical care	Varied	Shoulder pain	N	N	N	N	Y	N	N
Washington State Department of Labor and Industries (Washington State Department of Labor and Industries 2018)	2018	Medical Treatment Guideline for Shoulder Diagnosis and Treatment	All care	US	Shoulder injury	Y	Y	Y	Y	Y	Y	Y
Yu (Yu et al. 2021)	2020	Noninvasive management of soft-tissue disorders of the shoulder: A clinical practice guideline from the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration	Primary care (non-invasive)	Canada	Soft-tissue disorder of the shoulder	Y	Y	N	N	N	N	N

Table 6 Brief overview of included guidance document: non-operative care

Author, year	Clinical examination	Medical therapy	Physiotherapy including exercise	Injections
Academy of Medical Royal Colleges, undated	[Nil provided]	[Nil provided]	Effective and safe in many cases	[Nil provided]
AIM Specialty Health, 2021	[Nil provided]	[Nil provided]	General requirement	May be considered
American Academy of Orthopaedic Surgeons, 2019	Strong evidence supports	[Nil provided]	Strong evidence supports (but may progress)	Moderate evidence supports (corticosteroids) Limited evidence supports (hyaluronic acid) Limited evidence does not support (platelet-rich plasma)
American College of Radiology	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
American College of Radiology	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
American College of Radiology	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
American College of Radiology	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
Australian Orthopaedic Association, 2017	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
British Elbow & Shoulder Society, 2014	Described	Specified measures are described	Specified measures are described	Specified measures are described
Colorado Department of Labor and Employment, 2015	Described. Recommendations provided for consideration	Described. Non-steroidal anti-inflammatories and analgesics may be prescribed. Acute rotator cuff tear may indicate the need for limited opioids use.	There is good to strong evidence for benefit of an exercise strategy; manual therapy may be useful (12 sessions). Relative rest initially.	Strong evidence that subacromial steroid injections for rotator cuff tendinopathy have a rapid benefit Some evidence that intra-articular triamcinolone provides pain relief for up to 3 months in elderly patients with FTT.
Dierks, 2014	A combination of specified tests are recommended	Recommended: NSAIDs if necessary	Recommended: Rest, exercise	Recommended: Corticosteroids may be used for severe pain, if possible under ultrasound guidance, in the first 8 weeks)
Eubank 2021	Described	There is moderate evidence to support additional means of pain control like oral NSAIDs corticosteroids prior to conservative management or at the six week mark if the patient is	Described: an appropriate trial of conservative management includes at least 12 weeks of an active, strength-based home or supervised exercise	There is moderate evidence to support additional means of pain control such as injectable corticosteroids prior to conservative management or at the six week mark if the patient is

Author, year	Clinical examination	Medical therapy	Physiotherapy including exercise	Injections
		experiencing difficulty in engaging in exercises due to pain.	therapy program as the primary treatment option. There is strong evidence to support manual therapy such as joint mobilisations, manipulations and soft tissue techniques.	experiencing difficulty in engaging in exercises due to pain.
Hohmann, 2020	Described	Described	Described	Described
Hopman 2013	Recommended. A range of tests are provided.	Recommended. Injured workers should be prescribed paracetamol as the initial choice for mild to moderate pain Injured workers with acute shoulder pain may be prescribed NSAIDs (either oral or topical) for pain relief. NSAIDs can be prescribed alone or in conjunction with paracetamol.	Recommended. Injured workers should be initially treated with exercise prescribed and reviewed by a suitably qualified healthcare provider. This may be combined with manual therapy.	Recommended. For pain reduction in injured workers with persistent pain or who fail to progress following initiation of an active, non-surgical treatment program, the clinician may consider subacromial corticosteroid injections combined with a local anaesthetic.
Industrial Insurance Chiropractic Advisory Committee	[Nil provided]	[Nil provided]	Fair evidence on the use of manual or manipulative therapy	Suggested that corticosteroid injections are superior to physiotherapy interventions. Both blind and US-guided injection techniques are equally accurate; thus blind injections should be the technique of choice Platelet-rich plasma is not recommended
Juel, 2019	Clinical test and radiologic examination described. Recommended a combination of clinical examinations (pain arc, pinch test, glenohumeral mobility and isometric rotator cuff force) to diagnose subacromial pain and full thickness rotator cuff rupture for diagnostic accuracy. Recommended examination of passive outward rotation for	Recommended NSAIDs in the lowest dose over the shortest possible time for severe pain that impedes activity (weak recommendation)	Instructed home exercises are recommended and should include exercises for the muscles of the rotator cuff and shoulder blade for 5–12 weeks. Guided exercises (includes exercises for the rotator cuff and shoulder blade muscles) 3 months is recommended.	Suggested steroid injection for severe pain that impedes movement. Repeated injection is not recommended.

Author, year	Clinical examination	Medical therapy	Physiotherapy including exercise	Injections
	assessment of mobility in the glenohumeral joint			
Kauta, 2021	[Nil provided]	Described that initial management of various degenerative shoulder conditions may include up to a 3-month course of anti-inflammatory and analgesic drugs	Suggested that initial management may include physiotherapy with anti-inflammatory and analgesic drugs for 3 months	Suggested that if there is deterioration or no improvement during this initial course of treatment, the treating primary care physician may upscale to local anaesthetic and steroid injections
Kassolik, 2018	Recommended patient interview, functional assessment and clinical test, palpation	[Nil provided]	Recommended massage for painful shoulder syndrome. For shoulder impingement syndrome, the main physiotherapeutic intervention is active motor therapy. The use of low-level laser therapy, high-intensity laser therapy, therapeutic ultrasound, transcutaneous electrical nerve requires more research	[Nil provided]
Klauser, 2012	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
New York State Workers Compensation Board, 2021	Recommended, specific tests are described	May include medications. Acute rotator cuff tear could indicate the need for limited narcotics use	Should be considered. Operative procedures for impingement syndrome should not be considered prior to an adequate trial of physical rehabilitation that includes direction and supervision by an appropriate, licensed professional and active patient participation. Such a trial should normally last for a minimum of 6 weeks. For rotator cuff, if no clinically significant increase in function for a PTT or FTT is observed after adequate participation in a rehabilitation program (2–3 sessions per week for 4 weeks), a surgical consultation is indicated.	Recommended in select patients as clinically indicated. Subacromial space injection with steroids may be therapeutic if the patient responded positively to a diagnostic injection of an anaesthetic. Not more than 2–3 times annually, maximum of 3 injections to the same site. Not indicated for rotator cuff injury.
NHS 2013	Assessment of patient based on the clinical guideline to standardise	If pain is the limiting factor then a review of analgesia or a therapeutic injection can be considered	Should be considered: Postural correction and scapula exercise, shoulder stretches and ROM exercise,	Injection can be considered provided there are no contraindications.

Author, year	Clinical examination	Medical therapy	Physiotherapy including exercise	Injections
	assessment and diagnosis of common musculoskeletal shoulder condition		weight-bearing exercise, strengthening, movement and proprioceptive re-education and co, plyometric work and graded return to sport or normal function, stability. If lack of function is the limiting factor then a review of exercises can be considered	
NHS England, 2018	[Nil provided]	[Nil provided]	Effective and safe in many cases	[Nil provided]
Olivia, 2015	Three physical tests are recommended	Described	It is possible that rehabilitation is effective	Described. Corticosteroids may reduce pain in the short term.
Rees 2021	Emphasised that diagnosis is based in history and examination	Included the use of analgesics as conservative treatment.	Recommended physiotherapy rehabilitation is usually for six weeks initially unless physiotherapists identify a reason for earlier referral to secondary care. If there is patient improvement in the first six weeks of physiotherapy, then at least another six weeks therapy is justified	No more than two subacromial corticosteroid injections should be given. Image-guided subacromial injections should NOT be used.
Sconfienza, 2020	[Nil provided]	[Nil provided]	[Nil provided]	Ultrasound-guided percutaneous irrigation of calcific tendinopathy is more effective than subacromial-steroid injection. Ultrasound-guided platelet-rich plasma injection in rotator cuff tendinopathy or partial tear is safe and effective based on preliminary results. Ultrasound-guided PRP injection in patients with arthroscopically repaired rotator cuff tears does not demonstrate conclusive benefit for reducing postoperative pain after arthroscopy compared to placebo. Ultrasound-guided and fluoroscopy-guided acromioclavicular joint injections are significantly more

Author, year	Clinical examination	Medical therapy	Physiotherapy including exercise	Injections
				<p>accurate than palpation-guided injections.</p> <p>Intra-articular ACJ local anaesthetic and/or steroid injections produce pain reduction, with imaging guidance improving the outcome compared to palpation.</p> <p>Subacromial bursa injections under ultrasound guidance are feasible and tend to be more accurate than palpation-guided injections, although there is conflicting evidence about clinical superiority.</p> <p>There is conflicting evidence about the efficacy of triamcinolone acetonide or methylprednisolone acetate.</p> <p>Ultrasound-guided SASD bursa injection of hyaluronic acid is more effective than placebo in patients with painful shoulder.</p> <p>Ultrasound-guided SASD bursa corticosteroid injection is more effective than hyaluronic acid injection in patients with painful shoulder in the short term.</p>
Society of Radiographers and British Medical Ultrasound Society, 2021	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
Vandvik, 2019	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
Washington State Department of Labor and Industries, 2018	Described	Described. May be considered.	Described. Brief rest, less than 4 days, therapeutic exercise and mobilisation.	Described. Because corticosteroid use is associated with side effects such as weakening of connective tissue, no more than 3 injections are recommended under one claim for the shoulder, 4 injections per lifetime
Yu 2020	Recommended evaluation of shoulder pain to rule out major or structural pathologies		For symptoms less than or equal to 3 months: Recommended: Manipulation, low-level laser therapy, multimodal	

			<p>care which includes heat/cold, joint mob and ROM exercises; NOT recommended: Diacutaneous fibrolysis, ultrasound, interferential current therapy, taping, soft-tissue massage and cervicothoracic spine manipulation and mobilisation as an adjunct to exercise (i.e. range-of-motion, strengthening and stretching exercise) for shoulder pain (defined as pain between the neck and the elbow at rest or during movement of the arm)</p> <p>For symptoms greater than 3 months: Recommended: Strengthening and stretching exercises, cervicothoracic spine manipulation and mobilisation for shoulder pain when associated pain or restricted movement of the cervicothoracic spine, thoracic spine manipulation, low-level laser therapy, laser acupuncture, general physician care (information, advice, and pain contingent medical or pharmaceutical therapy), multimodal care that includes the combination of (if not previously given in first 3 months of care: a) heat/cold, b) joint mobilisation, c) range-of-motion exercise; NOT recommended: Diacutaneous fibrolysis, shockwave therapy, soft-tissue massage, ultrasound, interferential current therapy, taping, cervicothoracic spine manipulation and mobilisation as an adjunct to exercise (i.e. range-of-motion, strengthening and stretching exercise) for shoulder pain (defined as pain between the neck and the elbow at rest or during movement of the arm)</p>	
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Abbreviations

NSAID = non-steroidal anti-inflammatory drug, **FTT** = full-thickness tear, **PRP** = platelet-rich plasma, **PTT** = partial-thickness tear, **US** = ultrasound

Table 7 Brief overview of included guidance document: radiology and imaging

Author, year	Radiology	Ultrasound	MRI	Other
Academy of Medical Royal Colleges, undated	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
AIM Specialty Health, 2021	[Nil provided]	[Nil provided]	[Nil provided]	Imaging report required (not specified)
American Academy of Orthopaedic Surgeons, 2019	[Nil provided]	Strong evidence supports (as adjunct to clinical exam)	Strong evidence supports (as adjunct to clinical exam)	MRA: Strong evidence supports (as adjunct to clinical exam)
American College of Radiology, 2018 (atraumatic)	Initial imaging: usually appropriate Pain after rotator cuff repair: recommended	Initial imaging: usually not appropriate. Initial radiographs inconclusive: usually appropriate Pain after rotator cuff repair: usually appropriate	Initial imaging: usually not appropriate Initial radiographs inconclusive: usually appropriate Pain after rotator cuff repair: usually appropriate	Initial imaging: usually not appropriate Initial radiographs inconclusive: MR or CT arthrography may be appropriate Pain after rotator cuff repair: MR arthrography: may be appropriate
American College of Radiology, 2017 (traumatic)	Initial imaging: usually appropriate	Initial imaging: usually not appropriate. Initial radiographs negative: may be appropriate (disagreement) Radiographs normal. Physical examination findings consistent with rotator cuff tear: may be appropriate	Initial imaging: usually not appropriate. Initial radiographs negative: usually appropriate Radiographs normal. Physical examination findings consistent with rotator cuff tear: usually appropriate	Initial imaging: usually not appropriate. Initial radiographs negative: MR or CT arthrography may be appropriate. Radiographs normal. Physical examination findings consistent with rotator cuff tear: MR arthrography usually appropriate; CT arthrography may be appropriate
American College of Radiology, 2021 (after arthroplasty)	Initial imaging: usually appropriate	Suspected rotator cuff tear or other soft-tissue abnormality. Additional imaging following radiographs: Usually appropriate	Suspected rotator cuff tear or other soft-tissue abnormality. Additional imaging following radiographs: Usually appropriate	Suspected rotator cuff tear or other soft-tissue abnormality. Additional imaging following radiographs: CT arthrography usually appropriate
American College of Radiology, 2020 (MRI of the shoulder)	Radiographs are usually the first imaging test performed for most suspected abnormalities in the shoulder and will often suffice to diagnose or exclude an abnormality or to direct further imaging evaluation	Ultrasound can be used to guide arthrographic injection	Primary indications for MRI of the shoulder include rotator cuff tendon abnormalities: massive, full-thickness, partial-thickness, and recurrent (postoperative) tears, tendinopathy, calcific tendinitis and cuff tear arthropathy	Conventional single-contrast or double-contrast arthrography can accurately depict most articular-surface and full-thickness tears of the rotator cuff

Author, year	Radiology	Ultrasound	MRI	Other
Australian Orthopaedic Association, 2017	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
British Elbow & Shoulder Society, 2014	Helpful in primary care	Rarely needed in primary care Secondary care: if appropriate, to assess the integrity and state of rotator cuff muscles and tendons	Rarely needed in primary care Secondary care: if appropriate, to assess the integrity and state of rotator cuff muscles and tendons	[Nil provided]
Colorado Department of Labor and Employment, 2015	Radiographic imaging is generally well accepted as an initial test based on specific indications (provided). It should not be routinely performed for most non-traumatic diagnoses. X-ray as initial can assess acromion morphology.	Adjunctive testing, MRI, US 'may be considered' for surgery candidates or after 4–6 weeks of conservative therapy, if required.	Adjunctive testing, MRI, US 'may be considered' for surgery candidates or after 4–6 weeks of conservative therapy, if required.	There is good evidence that MRI, MRA, and US are all accurate at identifying full-thickness rotator cuff tears in patients whose history and physical examination makes them candidates for possible surgery. The subacromial injection has generally been considered the gold standard for differentiating ROM loss from impingement versus rotator cuff tears.
Dierks, 2014	Recommended: Can be used to determine osteoarthritis, bone abnormalities or calcium deposits	Recommended: Advised if the first period of non-operative treatment fails (at 6 weeks)	MRI is recommended when US is inconclusive or unavailable and to be used in patients indicated for surgery	[Nil provided]
Eubank, 2021	Recommended: all patients presenting with shoulder pain at the primary care level should be referred for x-ray	Additional diagnostic imaging such as MRI is often unnecessary and should not be ordered at the primary care level.	Additional diagnostic imaging such as MRI is often unnecessary and should not be ordered at the primary care level. MRI requests should be left to the discretion of the orthopaedic surgeon primarily for surgical planning purposes or a trained shoulder expert in collaboration with a specialist.	[Nil provided]
Hohmann, 2020	Suggestion: Radiologic evidence of mechanical impingent	[Nil provided]	Suggestion: for evidence of a high degree or complete rotator cuff tear on magnetic resonance imaging	[Nil provided]
Hopman, 2013	X-rays and imaging are not indicated in the first four to six weeks for an injured worker presenting with	In the absence of access to MRI or for those with contraindications for MRI, refer injured workers with suspected	Patients who have experienced significant activity restriction and pain for four to six weeks following initiation	[Nil provided]

Author, year	Radiology	Ultrasound	MRI	Other
	suspected rotator cuff syndrome in the absence of 'red flags'	rotator cuff syndrome for ultrasound and plain film X-ray.	of an active, non-surgical treatment program and have had no response to the treatment program should be referred for MRI and plain film X-ray	
Industrial Insurance Chiropractic Advisory Committee	Plain film radiography is useful in impingement	US is valuable for detecting full-thickness cuff tears. Partial tears are sometimes detectable	MRI may be useful when patients are unresponsive to conservative care.	CT arthrograms are used mainly for glenoid labrum and rotator cuff tears.
Juel, 2019	Strong recommendation: X-rays are recommended in people under the age of 30 with persistent shoulder pain and in people over the age of 70 Weak/conditioned recommendation: X-ray is recommended in the absence of guided training for assessment of limescale > 5mm in the rotator cuff	Strong recommendation: Ultrasound is recommended in case of clinical suspicion of full thickness rupture.	Strong recommendation: MRI is recommended in case of clinical suspicion of full thickness rupture. Strong recommendation: MRI is recommended in case of suspected serious illness	[Nil provided]
Kauta, 2021	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
Kassolik, 2018	[Nil provided]	The application of specialist diagnostic tests (MRI, ultrasound, arthrography, MRA) should be proposed only at a later stage of treatment if physical therapy is not effective and if surgery is taken into account	The application of specialist diagnostic tests (MRI, ultrasound, arthrography, MRA) should be proposed only at a later stage of treatment if physical therapy is not effective and if surgery is taken into account	[Nil provided]
Klauser, 2012	[Nil provided]	An evidence level of A (highest) was reported for full-thickness and partial-thickness cuff tears with a final consensus of 3 (high) and 2 (moderate), respectively No change in 2017 update	[Nil provided]	[Nil provided]
NHS, 2013	Indicated to detect or to exclude pathology when diagnosis is obscure and thus contribute to decisions regarding further management	[Nil provided]	[Nil provided]	[Nil provided]
New York State Workers Compensation Board, 2021	X-ray recommended in select patients as clinically indicated (calcification or bone spurs)	Recommended in select patients as clinically indicated. US, MRI, MRA indicated when shoulder pain is	Recommended in select patients as clinically indicated. US, MRI, MRA indicated when shoulder pain is	Recommended in select patients as clinically indicated. US, MRI, MRA indicated when shoulder pain is

Author, year	Radiology	Ultrasound	MRI	Other
		refractory to 4–6 weeks non-operative treatment to show positive evidence of deficit in rotator cuff	refractory to 4–6 weeks non-operative treatment to show positive evidence of deficit in rotator cuff. MRI should be performed sooner (e.g., one to two weeks), when there is clinical suspicion of full-thickness rotator cuff tear	refractory to 4–6 weeks non-operative treatment to show positive evidence of deficit in rotator cuff
NHS England, 2018	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
Olivia, 2015	No formal recommendation. X-ray can be used to exclude other causes	No formal recommendation. Can identify and quantify rotator cuff injury	No formal recommendation. MRI can confirm full-thickness tears; excellent for FTT, limited for PTT	No formal recommendation. MRA may be considered
Rees, 2021	Recommended X-ray with two views (true anteroposterior view and axillary view) in primary and intermediate care can be useful in patients not improving with conservative management. Imaging with ultrasound or MRI is rarely indicated in primary, community and intermediate care.	Not indicated in primary, community and intermediate care.	Not indicated in primary, community and intermediate care	[Nil provided]
Sconfienza, 2020	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
Society of Radiographers and British Medical Ultrasound Society, 2021	[Nil provided]	Justification and clinical history Clinical history may include, but not be limited to: • ?Rotator cuff tear/tendinopathy • Restricted range of movement • Pain on abduction • Swelling/lumps Described. No formal recommendation provided.	[Nil provided]	[Nil provided]
Vandvik, 2019	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]
Washington State Department of Labor and Industries, 2018	X-ray is recommended for rotator cuff tear	Ultrasound may be recommended to diagnose full and partial-thickness tears	For suspected impingement, MRI reveals evidence of	MRI, ultrasound or X-ray arthrogram for suspected rotator cuff tear

Author, year	Radiology	Ultrasound	MRI	Other
			tendinopathy/tendinitis or a rotator cuff tear MRI, ultrasound or X-ray arthrogram for suspected rotator cuff tear	
Yu, 2020	[Nil provided]	[Nil provided]	[Nil provided]	[Nil provided]

Abbreviations

CT: computed tomography, MRA = magnetic resonance arthrography, MRI = magnetic resonance imaging, ROM = range of movement, US = ultrasound

Table 8 Recommendations for the use of surgery (summary)

Author, year	Previous care	Rotator cuff repair	Rotator cuff repair with subacromial decompression	Subacromial decompression (alone)	Other surgery
Academy of Medical Royal Colleges, undated				Indicated for specified patients Decompression for pure subacromial impingement (excluding other indications including rotator cuff tear) should only be offered... For patients with persistent or progressive symptoms, in spite of adequate non-operative treatment	
AIM Specialty Health, 2021	General requirement: Conservative care (physical therapy and complementary management) Abstinence from tobacco for 6 weeks prior to surgery is recommended	Acute FTT Chronic or degenerative FTT PTT Supported with specified indications including history, pain, weakness, physical exam, recent imaging, failure of 6 weeks' conservative management (for chronic FTT or PTT)	Excluded	Not medically necessary for all indications	Reverse shoulder arthroplasty supported with specified indications Revision surgery supported with specified indications Biceps tenotomy supported with specified indications
American Academy of Orthopaedic Surgeons, 2019	[Nil provided]	Moderate evidence supports healed rotator cuff repairs show improved patient reported and functional outcomes compared to	Moderate strength evidence does not support the routine use of acromioplasty as a concomitant treatment as compared to arthroscopic repair	[Nil provided]	Distal clavicle resection as a concomitant treatment: Moderate evidence supports

Author, year	Previous care	Rotator cuff repair	Rotator cuff repair with subacromial decompression	Subacromial decompression (alone)	Other surgery
		<p>physical therapy and unhealed rotator cuff repairs</p> <p>Strong evidence supports physical therapy and operative treatment result in significant improvement in patient-reported outcomes for patients with symptomatic small to medium full-thickness rotator cuff tears</p> <p>Strong evidence supports repair in patients that failed conservative management with high-grade partial thickness rotator cuff tears</p> <p>Consensus: In the absence of reliable evidence, the work group is unable to define a preference for the choice of debridement versus repair of high-grade partial-thickness cuff tears that have failed physical therapy, however repair of high grade partial tears could improve outcomes</p>	<p>alone for patients with small to medium sized full-thickness rotator cuff tears</p>		
Australian Orthopaedic Association, 2017				<p>Should only be performed when certain conditions are met: for symptoms that are significant and persistent and that have not responded to non-operative care, including injections and physiotherapy</p>	
British Elbow & Shoulder Society, 2014	<p>At least 6 weeks of non-surgical treatment, unless red flag identified</p>	<p>Can be considered for specified indications patients with:</p> <p>Acute (traumatic or degenerative) rotator cuff tear</p>	<p>If indicated a subacromial decompression may need to be performed in association with the tendon repair</p>	<p>Should be considered for patients with:</p> <p>Impingement pain in the absence of a rotator cuff tear</p>	

Author, year	Previous care	Rotator cuff repair	Rotator cuff repair with subacromial decompression	Subacromial decompression (alone)	Other surgery
		Persistent subacromial shoulder pain and weakness with ultrasound or MRI findings indicating a full thickness rotator cuff tear after adequate and appropriate conservative treatment		Impingement pain with an irreparable rotator cuff tear Impingement pain with a cuff tear that the patient chooses not to have repaired Failure of appropriate conservative management	
Colorado Department of Labor and Employment, 2015	For a PTT, 6-12 weeks of conservative therapy For impingement, when functional deficits interfere with activities of daily living and/or job duties after 3 to 6 months of active patient participation in an appropriate shoulder rehabilitation program, surgery may restore functional anatomy and reduce the potential for repeated impingement	If no increase in function for a partial tear is observed after 6 to 12 weeks, a surgical consultation is indicated. For full-thickness tears, it is thought that early surgical intervention produces better surgical outcome due to healthier tissues and often less limitation of movement prior to and after surgery. Options would include arthroscopic or open debridement and/or repair. Routine acromioplasty is not recommended.	An open or arthroscopic acromioplasty is not always necessary as an adjunct to rotator cuff repair and routine acromioplasty is not generally recommended. Tenodesis is not generally recommended. Coplaning is an acceptable procedure. Distal clavicular resection is not recommended for patients without AC joint pain. In cases with extensive rotator cuff tear, preservation of the coracoacromial ligament is recommended	There is some evidence that in the setting of non-traumatic subacromial impingement syndrome, bursectomy can decrease shoulder pain and improve function. Acromioplasty is not generally recommended. Spurs from the acromion may be removed. The distal clavicle should not be removed unless there is AC joint pain reproducible with direct compression. Preservation of the coracoacromial ligament is recommended to maintain joint stability.	
Dierks, 2014	Preferably treated non-operatively	Considered for a specific population When surgical repair of symptomatic rotator cuff tears is indicated, the condition of the muscles as well as age and activity level of the patient play a role in the decision The indication for surgical repair of a symptomatic rotator cuff tear depends on the size of the tear, the condition of the muscles, and	[Nil provided]	Considered for a specific population If the patient does not respond to exhaustive non-operative treatment and does not qualify for a rehabilitation treatment, bursectomy can be considered	Surgical treatment of tendinosis calcarea is not recommended

Author, year	Previous care	Rotator cuff repair	Rotator cuff repair with subacromial decompression	Subacromial decompression (alone)	Other surgery
		the age and activity level of the patient			
Hohmann, 2020	If symptoms persist despite physical therapy for at least 6 weeks, including a short course of anti-inflammatory medication	If a high degree partial thickness tear (>50%) is observed, arthroscopic repair should be strongly considered	[Nil provided]	To consider if certain conditions are met: Pain for at least 6 months; positive physical test; symptoms persist despite at least 6 weeks physical therapy including anti-inflammatory medication; radiologic evidence of mechanical impingent; no MRI evidence of a high-degree tear; possible use of a steroid injection as a diagnostic tool	-
Hopman, 2013	On review, clinicians should refer injured workers for surgical opinion if there is a symptomatic, established small or medium, full-thickness rotator cuff tear. Clinicians should refer injured workers for surgical opinion if there is a symptomatic, full-thickness rotator cuff tear greater than 3 centimetres	[Not described]	[Not described]	[Not described]	[Not described]
New York State Workers Compensation Board, 2021	Acromioplasty should not be considered until a minimum 6 weeks/3-6 months of active patient participation in physical rehabilitation	For FTT conservative care is not required prior to surgical repair. If no clinically significant increase in function for a partial- or full-thickness tear is observed after adequate participation in a rehabilitation program, a surgical consultation is indicated. For PTT, requirements include pain in arc, pain at night, weakness, positive impingement sign, temporary relief of pain with	Repair can be either rotator cuff repair or acromioplasty.	Recommended if patients meet explicit criteria. Acromioplasty should not be considered until a minimum 6 weeks/3-6 months of active patient participation in physical rehabilitation. For acromial impingement syndrome requirements include pain in arc, pain at night, weakness, positive impingement sign, temporary relief of pain with	

Author, year	Previous care	Rotator cuff repair	Rotator cuff repair with subacromial decompression	Subacromial decompression (alone)	Other surgery
		anaesthetic and X-ray or imaging of rotator cuff deficit. For FTT requirements include pain in arc, pain at night, weakness, and -ray or imaging of rotator cuff deficit.		anaesthetic and X-ray or imaging of rotator cuff deficit	
NHS England, 2018				Indicated for specified patients Decompression for pure subacromial impingement (excluding other indications including rotator cuff tear) should only be offered... For patients with persistent or progressive symptoms, in spite of adequate non-operative treatment	
Olivia, 2015	There are some advantages from the utilisation of Therapeutic Exercise, singularly or in an Individual Rehabilitation Project, in patients with rotator cuff tears	Described. Not recommended for PTT.	Debridement with or without acromioplasty are frequent treatments for PTT involving less than 50% tendon thickness.	[Nil provided]	Reverse shoulder arthroplasty is an option for certain patients
Vandvik, 2019	[Nil provided]	[Nil provided]	Not recommended for patients with subacromial pain syndrome, also labelled as rotator cuff disease	Not recommended for patients with subacromial pain syndrome, also labelled as rotator cuff disease	[Nil provided]
Washington State Department of Labor and Industries, 2018	Any worker who does not gain meaningful functional improvement (30%–50%) within 4–6 weeks of conservative treatment should be considered for a specialist consultation	For acute FTT, repair may be appropriate with or without non-operative care Requirements include pain, weakness, X-ray and imaging. For chronic or degenerative FTT, repair may be appropriate following 6 weeks conservative care. Requirements include pain, weakness, X-ray and imaging. For PTT repair, repair may be appropriate following 6–12	Acromioplasty is not usually necessary during a rotator cuff repair; acromioplasty does not change the functional outcome after arthroscopic repair of the rotator cuff.	For subacromial impingement syndrome, subacromial decompression with or without acromioplasty may be considered after 12 weeks of conservative care. Requirements include pain, MRI or X-ray and further imaging; AND subacromial injection with local anaesthetic gives documented pain relief	Eligibility for rotator cuff repair (revision surgery) after previous rotator cuff surgeries described. Eligibility for rotator cuff salvage procedure described. Eligibility for debridement of calcific tendonitis described. Eligibility for reverse total shoulder arthroplasty described.

Author, year	Previous care	Rotator cuff repair	Rotator cuff repair with subacromial decompression	Subacromial decompression (alone)	Other surgery
		<p>weeks conservative care (depending on whether tear is greater or less than 50% of tendon thickness). Requirements include pain, weakness, tenderness over rotator cuff, and positive impingement sign, X-ray and imaging.</p>			

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