Quality-Based Procedures: Clinical Handbook for Degenerative Disorders of the Shoulder

Health Quality Ontario & Ministry of Health and Long-Term Care

July 2015 (Version 2)

Ontario

Suggested Citation

This report should be cited as follows:

Health Quality Ontario and Ministry of Health and Long-Term Care. Quality-based procedures: clinical handbook for degenerative disorders of the shoulder. Toronto (ON): Health Quality Ontario; 2015 TBD. 86 p. Available from: TBD.

Permission Requests

All inquiries regarding permission to reproduce any content in Health Quality Ontario reports should be directed to EvidenceInfo@hqontario.ca.

How to Obtain Clinical Handbooks from Health Quality Ontario

All clinical handbooks are freely available in PDF format at the following URL: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/clinical-handbooks.

Conflict of Interest Statement

There are no competing interests or conflicts of interest to declare.

About Health Quality Ontario

Health Quality Ontario is the provincial advisor on the quality of health care in Ontario, evaluating the effectiveness of health care technologies and services, providing evidence-based recommendations, reporting to the public on the quality of the health system, and supporting the spread of quality improvement throughout the system.

Disclaimer

The content in this document has been developed through collaborative efforts between the Ministry of Health and Long-Term Care, Health Quality Ontario, and the Expert Advisory Panel on Degenerative Disorders of the Shoulder. The template for the Quality-Based Procedures Clinical Handbook and all content in the "Purpose" and "Introduction" sections were provided in standard form by the ministry. All other content was developed by Health Quality Ontario with input from the expert advisory panel. As it is based in part on rapid reviews and expert opinion, this handbook may not reflect all the available scientific research and is not intended as an exhaustive analysis. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its reports. In addition, it is possible that other relevant scientific findings may have been reported since completion of the handbook and/or rapid reviews. This report is current to the date of the literature search specified in the Research Methods section of each rapid review. This handbook may be superseded by an updated publication on the same topic. A list of all Health Quality Ontario Quality-Based Procedures Clinical Handbooks is available at http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/clinical-handbooks.

Table of Contents

List of Abbreviations

AGREE	Appraisal of Guidelines for Research and Evaluation
DAD	Discharge Abstract Database
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HSFR	Health System Funding Reform
LHIN	Local Health Integration Network
MRI	Magnetic resonance imaging
NACRS	National Ambulatory Care Reporting System
QBP	Quality-Based Procedure

Quality-Based Procedures Clinical Handbook for Degenerative Disorders of the Shoulder

1.0 Purpose

This clinical handbook has been created to serve as a compendium of the evidence-based rationale and clinical consensus driving the development of the policy framework and implementation approach for degenerative disorders of the shoulder.

This document has been prepared for informational purposes only. This document does not mandate health care providers to provide services in accordance with the recommendations included herein. The recommendations included in this document are not intended to take the place of the professional skill and judgment of health care providers.

Version 2
In Version 2, the following sentence was deleted from Section 7.3 Episode-of-Care Recommended Practices (page 30): “Recommendations specific to shoulder surgery apply only to primary surgeries; therefore, revision surgeries are excluded”.

The QBP that was implemented for funding includes revision surgeries.

2.1 Introduction

The Ministry of Health and Long-Term Care (ministry) established Health System Funding Reform (HSFR) in Ontario in 2012 with a goal to develop and implement a strategic funding system that promotes the delivery of quality health care services across the continuum of care, and is driven by evidence and efficiency. HSFR is based on the key principles of quality, sustainability, access, and integration, and aligns with the four core principles of the ***Excellent Care for All Act***:

- Care is organized around the person to support their health;
- Quality and its continuous improvement is a critical goal across the health system;
- Quality of care is supported by the best evidence and standards of care; and
- Payment, policy, and planning support quality and efficient use of resources.

Since its inception in April 2012, the ministry has shifted much of Ontario's health care system funding away from the current global funding allocation (currently representing a large portion of funding) towards a funding model that is founded on payments for health care based on best clinical evidence-informed practices.

Principles of the *Excellent Care for All Act* have been further reinforced first by Ontario's Action Plan for Healthcare in January 2012, and recently with Patients First: Action Plan for Healthcare in February 2015, which signals positive transformational activity which will require adaptive responses across sectors and organizational levels at a time of accelerated change. The ministry's commitment is to make Ontario the best health care system in the world.

The 2012 Action Plan identified HSFR as a lever to advance quality and ensure that the right care gets provided at the right place and at the right time. HSFR focuses on delivering better quality care and maintaining the sustainability of Ontario's universal public health care system. Ontario is shifting the focus of its health care system away from one that has primarily been health care provider-focused, to one that is patient-centred. The 2015 Action Plan continues to put patients at the heart of the health care system by being more transparent and more accountable to provide health care in a way that maximizes both quality and value.

HSFR comprises two key components:

1. Organizational-level funding, which will be allocated as base funding using the Health-Based Allocation Model (HBAM); and
2. Quality-Based Procedure (QBP) funding, which will be allocated for targeted activities based on a "(price × volume) + quality" approach premised on evidence-based practices and clinical and administrative data.

2.1 'Money Follows the Patient'

Prior to the introduction of HSFR, a significant proportion of hospital funding was allocated through a global funding approach, with specific funding for select provincial programs, wait times services, and other targeted activities. However, a global funding approach may not account for complexity of patients, service levels, and costs, and may reduce incentives to adopt clinical best practices that result in improved patient outcomes in a cost-effective manner. These variations in patient care evident in the global funding approach warranted the move towards a system where 'money follows the patient.'

Under HSFR, provider funding is based on: the types and quantities of patients providers treat, the services they deliver, the quality of care delivered, and patient experience/outcomes. Specifically, QBPs incent health care providers to become more efficient and effective in their patient management by accepting and adopting clinical best practices that ensure Ontarians get the right care, at the right time, and in the right place.

Quality-based procedures were initially implemented in the acute care sector, but as implementation evolves, they are being expanded across the continuum of care, including into the community home care sector, in order to address the varying needs of different patient populations.

Internationally, similar models have been implemented since 1983. While Ontario is one of the last leading jurisdictions to move down this path, this positions the province uniquely to learn from international best practices and pitfalls, in order to create a sustainable, efficient, and effective funding model that is best suited for the province and the people of Ontario.

2.2 What Are Quality-Based Procedures?

QBPs are clusters of patients with clinically related diagnoses or treatments that have been identified using an evidence-based framework as providing opportunity for process improvements, clinical re-design, improved patient outcomes, enhanced patient experience, and potential health system cost savings.

Initially developed in the acute (hospital) sector, QBPs were defined as "procedures." However, as implementation evolved since the introduction of QBPs in 2012, so too has the approach. Currently, the expanded focus is on care provided in other parts of the health care sector with a focus on a more functional/programmatic/population-based approach. As a result, the definition of QBPs is expanding to include Quality-Based Procedures, Programs, and Populations.

QBPs have been selected using an evidence-based framework. The framework uses data from various sources such as, but not limited to: the Discharge Abstract Database (DAD) and National Ambulatory Care Reporting System (NACRS) adapted by the ministry for its Health-Based Allocation Model repository. The Health-Based Allocation Model Inpatient Grouper groups in-patients based on the diagnosis or treatment responsible for the majority of their patient stay. Additional data has been used from the Ontario Case Costing Initiative (OCCI), and Ontario Cost Distribution Methodology (OCDM). Evidence published in literature from Canada and international jurisdictions, as well as World Health Organization reports, has also assisted with the definition of patient clusters and the assessment of potential opportunities (e.g., reducing variation, improving patient outcomes, sustainability).

The evidence-based framework assesses patients using five perspectives, as presented in Figure 1. It is this evidence-based framework that has identified QBPs that have the potential to improve quality of care, standardize care delivery across the province, and show increased cost efficiency.

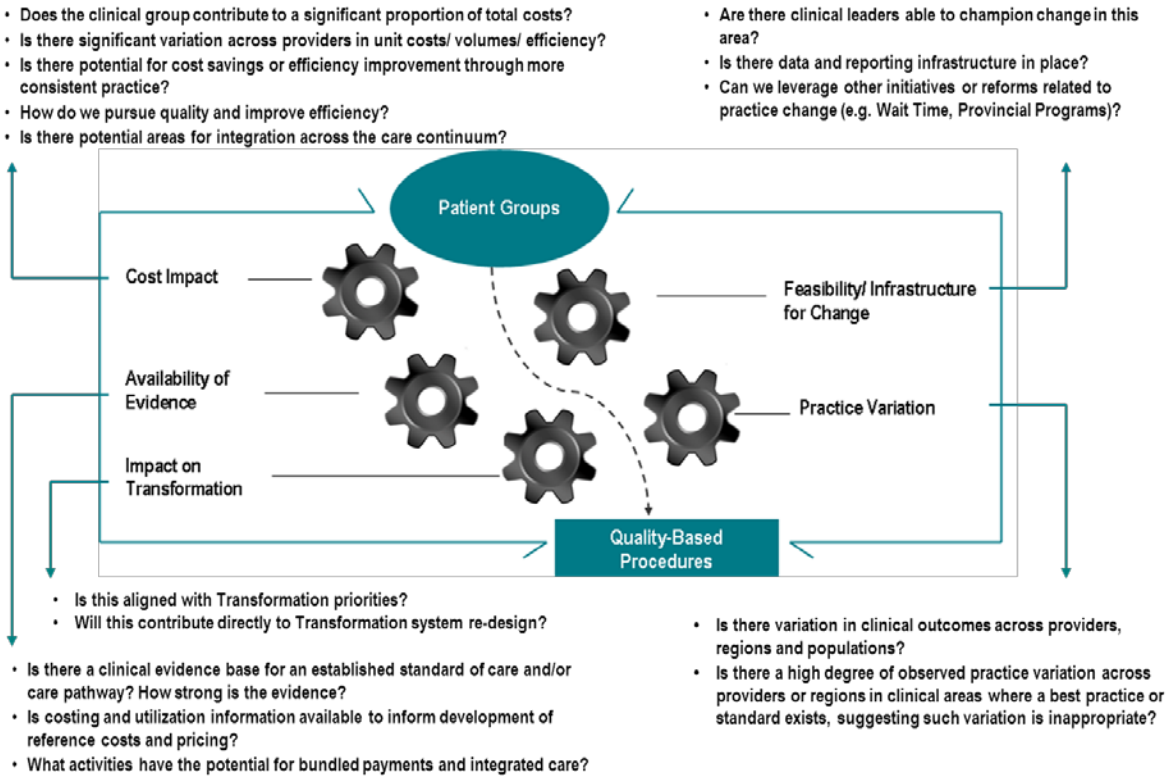

Figure 1: Evidence-Based Framework

2.2.1 Practice Variation

Practice variation is the cornerstone of the QBP evidence-based framework. A demonstrated large practice or outcome variance across providers or regions in clinical areas, where a best practice or standard exists, represents a significant opportunity to improve patient outcomes through focusing on the delivery of standardized, evidence-informed practices. A large number of 'Beyond Expected Length of Stay' and a large standard deviation for length of stay and costs were flags to such variation.

2.2.2 Availability of Evidence

A significant amount of research has been conducted and collected, both nationally and internationally, to help develop and guide clinical practice. Working with clinical experts, best practice guidelines and clinical pathways can be developed for QBPs and establish appropriate evidence-informed indicators. These indicators can be used to measure the quality of care and help identify areas for improvement at the provider level, and to monitor and evaluate the impact of QBP implementation.

2.2.3 Feasibility/Infrastructure for Change

Clinical leaders play an integral role in this process. Their knowledge of the identified patient populations, and the care currently provided and/or required for these patients, represents an invaluable element in the assessment of much needed clinical delivery and clinical process improvements. Many groups of clinicians have already developed care pathways to create evidence-informed practice. There is now an opportunity for this knowledge to be transferred provincially.

2.2.4 Cost Impact

The provincial footprint from a financial perspective also impacts the selection of the QBP. This may include QBPs that are high volume and low cost, as well as those that are low volume and high cost (i.e., specialized procedures that demonstrate opportunity for improvement).

A selected QBP should have, as a guide, no fewer than 1,000 cases per year in Ontario and represent at least one percent of the provincial direct cost budget. For patient cohorts that fall below these thresholds, the resource requirements to implement a QBP can be restrictive. Even where the patient cohorts represent an opportunity for improvement, it may not be feasible, even if there are some cost efficiencies, to create a QBP.

2.2.5 Impact on Transformation

The ***Action Plan for Health Care*** was launched in January 2012 and is already making a difference to Ontarians and our health care system:

- We've bent the cost curve since 2011/12
- We're improving the health of Ontarians
- We're enhancing the experience of Ontarians when they use the health system
- We're working with our health sector partners to improve the quality of health care

The next phase of Transformation will build on and deepen implementation of the Action Plan. HSFR is a key element of the Health System Transformation Agenda by ensuring sustainability and quality.

Selected QBPs should, where possible, align with the government's transformational priorities. In addition, the impact on transformation of certain patient populations hitherto not prioritized by the framework can be included as QBPs. This will ensure that QBPs are wide ranging in their scope (e.g., paediatric patient populations or patients requiring community care). QBPs with a lesser cost impact but a large impact on the provincial health care system may still be a high priority for creation and implementation.

2.3 How Will QBPs Encourage the Delivery of High-Quality, Evidence-Based Care and Innovation in Health Care Delivery?

The QBP methodology is driven by clinical evidence and best practice recommendations from the Clinical Expert Advisory Groups (Advisory Groups). Advisory Groups are composed of cross-sectoral, multi-geographic, and multi-disciplinary membership, including representation from patients. Members leverage their clinical experience and knowledge to define the patient populations and recommend best practices.

Once defined, these best practice recommendations are used to understand required resource utilization for QBPs and will further assist in the development of evidence-informed prices. The development of evidence-informed pricing for the QBPs is intended to incent health care providers to adopt best practices in their care delivery models, maximize their efficiency and effectiveness, and engage in process improvements and/or clinical re-design to improve patient outcomes.

Best practice development for QBPs is intended to promote standardization of care by reducing inappropriate or unexplained variation and ensuring that patients get the right care, at the right place, and at the right time. Best practice standards will encourage health service providers to ensure that appropriate resources are focused on the most clinically and cost-effective approaches.

QBPs create opportunities for health system transformation where evidence-informed prices can be used as a financial lever to incent providers to:

- Adopt best practice standards;
- Re-engineer their clinical processes to improve patient outcomes;
- Improve coding and costing practices; and
- Develop innovative care delivery models to enhance the experience of patients.

An integral part of the enhanced focus on quality patient care is the development of indicators to allow for the evaluation and monitoring of actual practice and support on-going quality improvement.

In addition, the introduction of additional QBPs such as outpatient and community-based QBPs will further help integrate care across sectors and encourage evidence-based care across the continuum.

3.0 Methods

3.1 Overview of Episode-of-Care Analysis Approach

To produce this work, Health Quality Ontario developed a novel method known as an *episode-of-care analysis* that draws conceptually and methodologically from several of Health Quality Ontario's core areas of expertise:

- **Evidence reviews and health technology assessments**—Recommended practices incorporate components of Health Quality Ontario's evidence review methods and draw from the recommendations of the Ontario Health Technology Advisory Committee, where the committee has made recommendations
- **Case mix grouping and funding methodology**—Cohort and patient group definitions use clinical input to adapt and refine case mix methods from the Canadian Institute for Health Information and the Ontario Health-Based Allocation Model
- **Clinical practice guidelines and pathways**—Recommended practices synthesize guidance from credible national and international bodies, with attention to the strength of evidence supporting each guideline
- **Analysis of empirical data**—Expert advisory panel recommendations are supported by a descriptive analysis of Ontario administrative datasets (e.g., DAD and NACRS). Depending on the QBP population, Health Quality Ontario works with researchers and ministry analysts to develop analyses for the expert advisory panel's review
- **Clinical engagement**—All aspects of this work are guided and informed by leading clinicians, scientists, and administrators with a wealth of knowledge and expertise in the clinical area of focus
- **Performance indicators**—Health Quality Ontario has been asked to leverage its expertise in performance indicators and public reporting to support the development of measurement frameworks to manage and track actual performance against recommended practices in the episodes of care

The development of the episode-of-care analysis involves the following key steps:

1. Defining the approach to cohort and patient stratification
2. Defining the scope of the episode of care
3. Developing the episode-of-care pathway model
4. Identifying recommended practices
5. Supporting the development of performance indicators to measure the episode of care

These steps are described in further detail throughout the handbook.

3.2 Defining the Approach to Cohort and Patient Stratification

At the outset of this project, the Ministry of Health and Long-Term Care provided Health Quality Ontario with a broad description of the clinical population. It also asked Health Quality Ontario to work with the Expert Advisory Panel on Degenerative Disorders of the Shoulder to define inclusion and exclusion criteria for the cohort they would examine using data from routinely reported provincial administrative databases. The population could encompass multiple distinct subpopulations (referred to as *patient groups*) with varying clinical characteristics. These patient groups would have different levels of severity, various treatments, and different distributions of expected resource use.

Informed by summaries of relevant literature and descriptive tables containing Ontario administrative data, the expert advisory panel recommended a set of inclusion and exclusion criteria to define the cohort. Using procedure codes from *Canadian Classification of Health Interventions* (CCI) and diagnosis codes from *International Classification of Diseases*, 10th Revision (Canadian Edition) (ICD-10-CA), the expert advisory panel excluded diagnoses with treatment protocols that would differ substantially from those of the general population, including pediatric cases and cases with clinically unrelated disorders and procedures. Next, the expert advisory panel recommended definitions for major patient groups within the cohort that were viewed as being relatively clinically homogeneous within the overall population.

3.3 Developing the Episode-of-Care Pathway Model

Health Quality Ontario has developed a model that brings together key components of the episode-of-care analysis through an integrated schematic. The model is structured around the parameters defined for the episode of care, including boundaries set by the index event and end points, segmentation (or stratification) of patients into the defined patient groups, and relevant services included in the episode. The model describes the pathway of each patient case included in the defined cohort, from initial presentation through segmentation into one of the defined patient groups on the basis of patient characteristics, and finally through the subsequent components of care that the patient receives before reaching discharge or end points otherwise defined.

Although the model bears some resemblance to a clinical pathway, it is not intended to be used as a traditional operational pathway for implementation in a particular setting. Rather, the model presents the critical decision points and phases of treatment, referred to as *care modules*. Care modules represent the major phases of care that a patient receives during a hospital episode, such as care on the ward and discharge planning. The process for identifying the recommended practices within each care module is described in the next section.

3.4 Identifying Recommended Practices

3.4.1 Consideration of Evidence Sources

We considered several evidence sources to develop the episode-of-care model and populate individual modules with best practice recommendations. We presented these possible sources to the expert advisory

panel. Preference was given to Ontario Health Technology Advisory Committee recommendations. Where recommendations from this committee did not exist, we sought additional evidence sources, including guidelines from other evidence-based organizations, Health Quality Ontario rapid reviews, empirical analyses of Ontario data, and, where necessary and appropriate, expert consensus.

3.4.2 Ontario Health Technology Advisory Committee Recommendations

We considered the Ontario Health Technology Advisory Committee recommendations as the standard of evidence for several reasons:

- **Consistency—**While many guidance bodies issue disease-specific recommendations, the committee provides a common evidence framework across all the clinical areas analyzed in all disease areas
- **Economic modelling—**The committee's recommendations are often supported by economic modelling to determine the cost-effectiveness of an intervention, whereas many guidance bodies assess only effectiveness
- **Decision-making framework—**The committee's recommendations are guided by a decision determinants framework that considers the clinical benefit offered by a health intervention, in addition to value for money, societal and ethical considerations, and economic and organizational feasibility
- **Context—**In contrast with recommendations and analyses from international bodies, recommendations from the Ontario Health Technology Advisory Committee are developed specifically for Ontario. This ensures that the evidence is relevant to the Ontario health system

3.4.3 Clinical Guidelines

With guidance from Health Quality Ontario medical librarians, we searched published Canadian and international guidelines that encompass the entirety of the pathway. Additionally, we further consulted the expert advisory panel to ensure all relevant guidelines were identified.

We evaluated the methodological rigour and transparency of clinical practice guidelines using the Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument. (1) AGREE II comprises 23 items organized into six quality domains—scope and purpose, stakeholder involvement, rigour of development, clarity of presentation, applicability, and editorial independence. (1) The AGREE II domain scores provide information about the relative quality of a guideline. A score of 1 indicates an absence of information or poor reporting; a score of 7 indicates exceptional reporting that meets all criteria. We selected guidelines for inclusion on the basis of individual AGREE scores, with an emphasis on the rigour-of-development score, which reflects the methods used to assess the quality of evidence supporting the recommendations. We included three or four highest-quality guidelines for both glenohumeral joint osteoarthritis and rotator cuff disease, including at least one contextually relevant guideline. We identified the quality of the evidence supporting each recommendation, as assessed and reported by the published guidelines, and noted inconsistencies and gaps between recommendations for further evaluation.

3.4.4 Evidence Reviews

Where there was inconsistency between guidelines, disagreement among expert advisory panel members, or uncertainty about evidence, we reviewed the evidence ourselves (Appendix 2).

3.4.5 Analysis of Administrative and Clinical Data

In addition to reviews of the published literature, the expert advisory panel also examined the results of descriptive analyses using Ontario administrative and clinical datasets. Other analyses reviewed included studies of current utilization patterns, such as average length of stay in hospital, and regional variation across Ontario in admission practices and hospital discharge settings.

3.4.6 Expert Consensus

The expert advisory panel assessed the best evidence for the Ontario health care system to arrive at the best practice recommendations (see 7.0 Recommended Practices for Degenerative Disorders of the Shoulder). Where the available evidence was limited or non-existent, recommendations were made on the basis of consensus agreement among the expert advisory panel members.

4.0 Description of Degenerative Disorders of the Shoulder

Glenohumeral joint osteoarthritis and rotator cuff disease are part of the group of degenerative diseases of the shoulder (2) and constitute the focus of this clinical handbook.

4.1 Glenohumeral Osteoarthritis

Glenohumeral osteoarthritis is a gradual, progressive, and mechanical breakdown of articular cartilage and other joint tissues, and is usually associated with pain, as well as loss of motion and function. (3) Increasing age, prior shoulder trauma, gender, and weight are risk factors for glenohumeral osteoarthritis. (3) The incidence of osteoarthritis of the glenohumeral joint is unclear, but it is the third most common joint to require replacement, after hip and knee, and its associated functional deficits are comparably disabling. (4)

The initial treatment for glenohumeral osteoarthritis is usually conservative (i.e., nonsurgical) treatment, which may include activity modification, physiotherapy, analgesic and anti-inflammatory medications, and corticosteroid injections into the joint. (2, 3) If conservative treatment fails, surgical options are available. (3)

Arthroscopic debridement has been suggested as a surgical option in patients who are refractory to conservative treatment (i.e., for whom conservative treatment is not effective), particularly in young or active patients who may wish to avoid or delay arthroplasty. (5) Debridement may alleviate mechanical symptoms and stabilize cartilage lesions. (6) Total shoulder arthroplasty is the gold standard surgical treatment for severe glenohumeral osteoarthritis; it involves replacing the humeral head (top of the upper arm bone) and prosthetic resurfacing of the glenoid. (2) Hemiarthroplasty is a surgical procedure that consists of replacing the humeral head. (2)

4.2 Rotator Cuff Disease

The rotator cuff consists of four muscle-tendon units that stabilize the glenohumeral joint during shoulder motion. (7) Rotator cuff disease occurs along a spectrum of rotator cuff tendinitis and partial- and full-thickness rotator cuff tears. (2, 8) It is divided into three stages according to its progression (8, 9):

- Stage I—acute inflammation and tendinitis or bursitis
- Stage II—chronic inflammation with or without degeneration
- Stage III—full rotator cuff tear

A rotator cuff tear is a discontinuation in one or more of the muscle-tendon units (i.e., a complete tear of either the muscle or the tendon). (10) Tears that involve only part of the tendon thickness and do not lead to retraction of the muscle-tendon unit are considered partial-thickness tears. (10) Tears associated with a full discontinuation of the rotator cuff fibres are considered full-thickness tears. (10)

Rotator cuff disease causes significant pain and loss of function. (11) It can lead to limitations of movement and of the ability to perform activities of daily living, and it can result in absences from work. (12) The condition is estimated to affect 4% to 32% of the population, with a rising prevalence with increasing age. (13)

The aim of treatment is to control pain and improve function. (9) The first line of treatment is conservative therapy, comprising anti-inflammatory medications, physiotherapy, and corticosteroid injections. (12) Surgery, such as acromioplasty (or subacromial decompression) and rotator cuff repair, is indicated in cases where conservative therapy fails. (10, 12)

Acromioplasty is performed by removing the anterior edge and the undersurface of the anterior part of the acromion (bony process of the scapula, or shoulder blade). The procedure can be performed using either an open or arthroscopic surgical technique. (12) The repair of a torn rotator cuff involves suturing the torn edges together and returning the tendon to the humeral head. (10) Surgical approaches include open, mini-open, and arthroscopic techniques. (14) In the open and mini-open approaches, the rotator cuff is repaired under direct vision through an incision in the skin. In contrast, in the arthroscopic approach, specially designed instruments (a camera, a fibre optic light source, and the instruments required for the repair) are inserted through a series of small incisions. (10) By combining open and arthroscopic techniques, the mini-open approach uses a smaller incision than is needed in an open procedure. (10)

5.0 Degenerative Disorders of the Shoulder: Cohort and Case Mix Analysis

In defining the cohort of patients with degenerative shoulder disorders receiving shoulder-related surgeries in hospital, we took a similar approach to that used by Health Quality Ontario in previous elective orthopaedic QBP populations, including primary hip and knee replacement and arthroscopic knee surgery. As the current population spans both in-patient and day surgery settings, the data elements used for this definition are drawn from the Canadian Institute for Health Information (CIHI) DAD and NACRS databases for in-patient discharges and day surgery encounters, respectively.

It is important to note that the cohort population defined here for QBP measurement and funding purposes is much narrower than the *clinical* cohort that is the subject of the recommended practices in this handbook. The focus of QBP funding and measurement is limited to hospital services, where acute in-patient and day surgery encounters provide the only consistently reported data collected across the province. Hence, this cohort definition focuses on the subpopulation of patients with degenerative disorders of the shoulder who receive hospital-based surgery.

Members of the expert panel variously estimated that only 5% to 15% of all patients who initially present with shoulder disorders will eventually require surgery. The majority of patients with shoulder disorders can be managed effectively with other treatment options such as physiotherapy. Furthermore, the expert panel commented that the wide regional variation observed across Ontario in age-standardized rates of shoulder surgery utilization may be associated with either a lack of access to or a lack of patient information on non-surgical treatments in many regions.

5.1 Cohort Inclusion and Exclusion Criteria

The following describes the detailed inclusion and exclusion criteria for the defined cohort population.

5.1.1 Inclusion Criteria

The codes below are based on the Canadian Institute for Health Information (CIHI) *Canadian Classification of Health Interventions*, 2012 Edition. (15) As this classification system is updated by CIHI, these codes will require updates to ensure that they capture all surgical procedures listed below.

Included are all acute in-patient discharges (cases recorded in the DAD) and day surgery encounters (cases recorded in the NACRS with Functional Centre listed as “day surgery”) with a Principal Procedure (DAD) or Main Intervention (NACRS) performed on one of the anatomical sites listed below.

Surgical procedures of the shoulder joint (1.TA.^^) codes include the following:

- 1.TA.52.^^
- 1.TA.53.^^
- 1.TA.55.^^
- 1.TA.58.^^
- 1.TA.59.^^
- 1.TA.72.^^
- 1.TA.73.^^
- 1.TA.74.^^

- 1.TA.75.^^
- 1.TA.80.^^
- 1.TA.83.^^
- 1.TA.87.^^
- 1.TA.93.^^

Surgical procedures of the acromioclavicular and sternoclavicular joints (1.TB.^^) codes include these:

- 1.TB.52.^^
- 1.TB.55.^^
- 1.TB.59.^^
- 1.TB.72.^^
- 1.TB.73.^^
- 1.TB.74.^^
- 1.TB.80.^^
- 1.TB.87.^^

Surgical procedures of the rotator cuff (1.TC.^^) codes include the following:

- 1.TC.57.^^
- 1.TC.59.^^
- 1.TC.72.^^
- 1.TC.80.^^

Surgical procedures of the muscles of arm around shoulder (1.TF.^^) codes include:

- 1.TF.57.^^
- 1.TF.58.^^
- 1.TF.72.^^
- 1.TF.80.^^
- 1.TF.87.^^

Surgical procedures of the tendons of arm around shoulder (1.TH.^^) codes include the following:

- 1.TH.58.^^
- 1.TH.72.^^
- 1.TH.80.^^

Rationale for inclusion: The anatomical sites listed above capture all shoulder-related procedures thought by the expert advisory panel to be relevant to the degenerative shoulder disorder population.

5.1.2 Exclusion Criteria

The following groups are excluded from the defined cohort population:

- **Cases with a non-surgical Principal Procedure or Main Intervention**—Defined as cases with a non-surgical Principal Procedure (DAD) or Main Intervention (NACRS) such as manipulations, injections, or diagnostic-only procedures.

  Rationale for exclusion: The expert advisory panel focused on surgical shoulder interventions because these are comprehensively captured in provincial administrative data: hospitals are mandated to report all acute in-patient discharges and day surgery encounters. Other nonsurgical interventions of the shoulder such as manipulations and injections may be carried out in a variety of outpatient settings where hospital reporting is not mandatory and is inconsistent; hence, the inclusion of these interventions would introduce bias and inconsistency in funding and performance measurement methodologies.

- **Urgent/emergent admissions**—Defined as urgent/emergency admissions for acute in-patient cases (DAD) or cases admitted through the emergency department for day surgery (NACRS)

  Rationale for exclusion: Cases involving shoulder surgery that present through the emergency department tend to be the result of fractures or other trauma, rather than degenerative disorders. These populations have very different care pathways (i.e., pre-operative care is almost non-existent) and utilization profiles (generally more costly with longer lengths of stay) from elective surgical admissions.

- **Patients aged < 18 years**—Defined as patients aged < 18 at time of admission (DAD) or registration (NACRS)

  Rationale for exclusion: Adolescent and paediatric patients are unlikely to have degenerative shoulder disorders of the kind focused on in this handbook, and are likely to have significantly different care pathways from the adult population.

- **Cases with shoulder instability–related disorders**—Defined as cases with a Most Responsible Diagnosis (DAD) or Main Problem (NACRS) code of M25.31, M25.32, M25.34, or M25.36

  Rationale for exclusion: From a clinical perspective, the expert advisory panel recommended that cases involving "instability"-related shoulder disorders are likely to require different treatment regimens and have significantly different care pathways from those with degenerative disorders.

- **Cases with temporary cement spacer implants**—Defined as cases with a Principal Procedure (DAD) or Main Intervention (NACRS) code of 1.TA.53.LA-SL-N

  Rationale for exclusion: Clinically, temporary cement spacers (only 15 cases in fiscal year 2012/13) are temporary procedures that generally function as an intermediate step toward another type of shoulder surgery. This small number of cases creates problems in terms of introducing heterogeneity into the ministry's case mix methodology, so these cases were recommended for exclusion.

- **Cases with diagnoses that are not related to musculoskeletal disorders or related device follow-up**—Defined as cases with a Most Responsible Diagnosis (DAD) or Main Problem (NACRS) code other than M^^ (musculoskeletal), T^^ (complications of device/treatment), or Z^^ (treatment-related follow-up)

  Rationale for exclusion: From a clinical perspective, this analysis focused on cases receiving surgery for degenerative shoulder disorders, presenting with either musculoskeletal-related diagnoses or, in rare cases, diagnoses consistent with follow-up care for a shoulder surgery. The panel opted to exclude cases presenting with fracture- or trauma-related diagnoses, as well as other assorted diagnoses such as diabetes complications. It should be noted that although most of the fracture-related shoulder surgery cases were already excluded through the exclusion of non-elective cases, the expert advisory panel suggested that the remaining cases with fracture-related diagnoses were likely to be patients who initially presented to hospital as urgent/emergent cases

and who were well or stable enough to be sent home to wait for an elective surgical procedure in the near future.

5.2 Shoulder QBP Subgroups

Shoulder surgery cases involving hospitalization are heterogeneous, with a mix of relatively minor procedures that can be performed on a day surgery basis, and major procedures such as shoulder arthroplasties that almost always require an in-patient admission. These subpopulations have key differences in both their clinical characteristics and their expected resource utilization. Hence, for the purposes of funding and performance measurement, it was recommended that three subgroups be adopted for stratifying the overall hospitalized shoulder surgery cohort. These are defined by Principal Procedure (DAD) or Main Intervention (NACRS—day surgery), and are detailed below.

Subgroup 1: repairs—These cases mainly involve rotator cuff and shoulder joint repairs performed to treat varieties of rotator cuff syndrome. They are defined by the following codes:

- 1.TA.80.^^
- 1.TB.80.^^
- 1.TC.80.^^
- 1.TF.80.^^
- 1.TH.80.^^

Subgroup 2: arthroplasties—These cases involve shoulder arthroplasties, including hemiarthroplasties, total shoulder arthroplasties, and reverse shoulder arthroplasties. Most hemiarthroplasties and total arthroplasties are performed to treat osteoarthritis, while reverse shoulder arthroplasties are more complex procedures performed in cases with combined osteoarthritis and rotator cuff repairs, or in cases where prior surgeries have failed. They are defined by this code:

- 1.TA.53.LA^^

Subgroup 3: other shoulder surgeries—These cases span a wide variety of different surgical procedures that do not involve repairs or arthroplasties, including drains, excisions, and releases. They are defined by the following codes:

- 1.TA.52.^^
- 1.TA.55.^^
- 1.TA.58.^^
- 1.TA.59.^^
- 1.TA.72.^^
- 1.TA.73.^^
- 1.TA.74.^^
- 1.TA.75.^^
- 1.TA.83.^^
- 1.TA.87.^^
- 1.TA.93.^^
- 1.TB.52.^^
- 1.TB.55.^^
- 1.TB.59.^^
- 1.TB.72.^^
- 1.TB.73.^^
- 1.TB.74.^^
- 1.TB.87.^^
- 1.TC.57.^^
- 1.TC.59.^^
- 1.TC.72.^^
- 1.TF.57.^^
- 1.TF.58.^^
- 1.TF.72.^^
- 1.TF.87.^^
- 1.TH.58.^^
- 1.TH.72.^^

Table 1 describes the different clinical and utilization characteristics found in these groups. For example, the vast majority of arthroplasties are performed on an in-patient basis, while the majority of repairs are performed on an outpatient basis.

Table 1: Length of Stay and Cost by Three Shoulder Surgery Subgroups

					Ontario Case Costing Initiative Costs			
Patient Subgroup	Setting	N Obs	Mean LOS	Mean HIG Weight	Mean ($)	Median ($)	25th Percentile ($)	75th Percentile ($)
Repairs	In-patient	799	1.25	0.66	4,289.17	3,710.96	3,105.69	4,789.65
	Day surgery	5,361	N/A	0.52	3,364.97	3,083.64	2,430.99	3,958.83
Arthroplasties	In-patient	1,052	2.40	1.50	10,593.01	9,702.04	7,758.79	12,217.72
	Day surgery	23	N/A	1.20	5,433.98	5,288.07	4,728.29	6,176.44
Other surgeries	In-patient	135	1.61	0.73	4,381.64	3,546.45	3,023.16	4,737.75
	Day surgery	1,144	N/A	0.47	1,650.96	1,474.55	1,113.23	2,007.62

Abbreviations: HIG, Health-Based Allocation Model Inpatient Grouper; N/A, not applicable; Obs, observations.

Within the three subgroups, it is possible to define further subgroups. For example, the arthroplasty subgroup includes total arthroplasties, hemiarthroplasties, and reverse shoulder arthroplasties, of which reverse arthroplasties tend to be significantly more expensive than the others (Table 2). Given the relatively small volumes of cases within these groups (e.g., 209 reverse shoulder arthroplasties in fiscal year 2012/13), the expert advisory panel opted to leave any decision to subdivide this group to the ministry's discretion.

Table 2: Length of Stay and Cost by Arthroplasty Subgroups

Procedure Group	No. of Obs	Average LOS	Average HIG Weight	Total OCCI Average Cost ($)
Hemiarthroplasty	226	2.3	1.50	8,475.90
Total arthroplasty	616	2.2	1.53	9,829.04
Reverse shoulder arthroplasty	209	2.9	1.59	14,560.94
All arthroplasties	1,051	2.4	1.54	10,479.05

Abbreviations: HIG, Health-Based Allocation Model Inpatient Grouper; LOS, length of stay; Obs, observations; OCCI, Ontario Case Costing Initiative.

5.3 Current State Utilization Analysis

Using the cohort and subgroup definitions outlined in the previous section, the expert advisory panel's recommendations were informed by several analyses examining current provincial utilization patterns around shoulder surgeries. Figure 2 illustrates age-standardized rates of rotator cuff and shoulder joint repairs by resident census area, with rates broken down by in-patient and day surgery utilization. The figure demonstrates wide variation in both the overall rates of use (from 26 surgeries per 100,000 residents in the

Peel census area to 97 surgeries per 100,000 residents in Renfrew) and the percentage of procedures conducted on an in-patient basis.

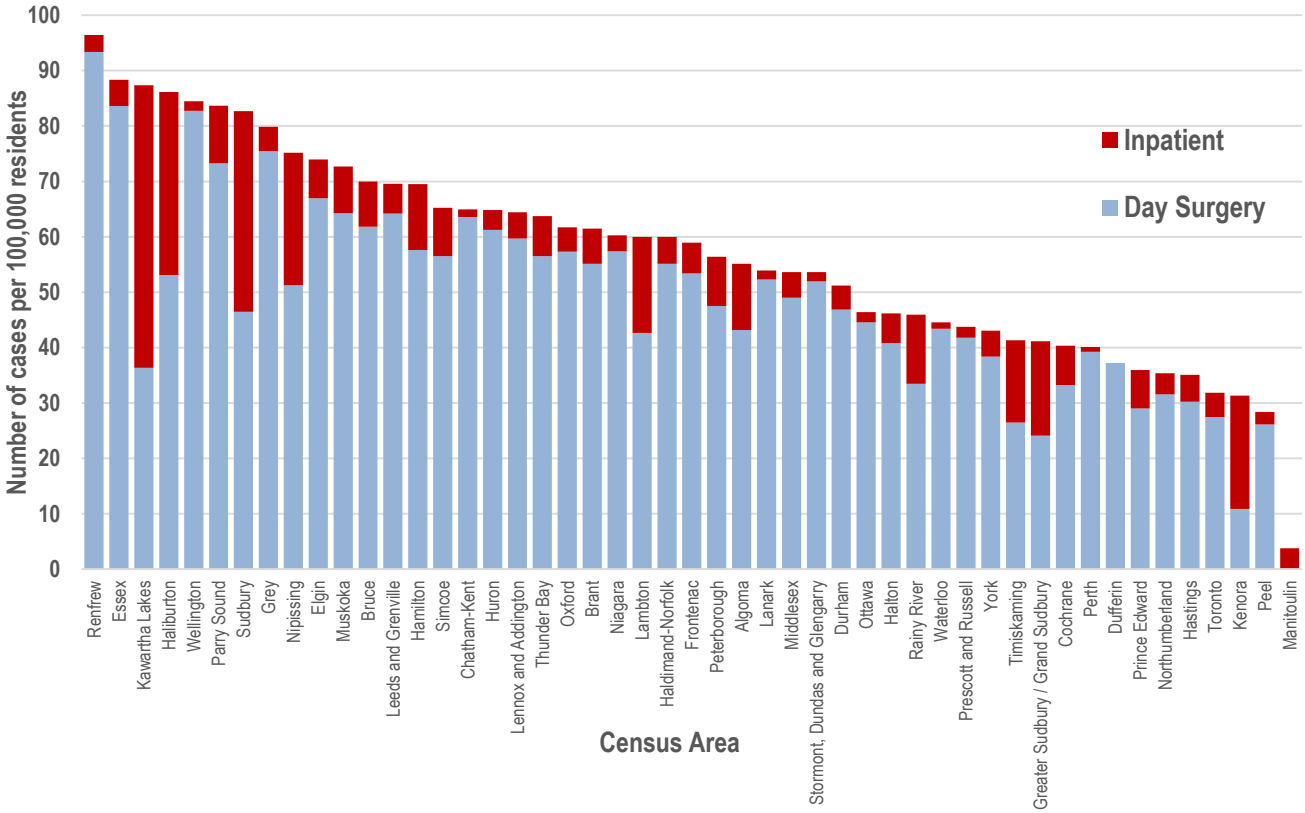

Figure 2: Age-Standardized Rates of In-patient and Day Surgery Rotator Cuff and Shoulder Repair per 100,000 Residents by Ontario Census Area, Fiscal Year 2013/14

Sources: Analysis conducted using Canadian Institute for Health Information Discharge Abstract Database and National Ambulatory Care Reporting System projects using direct age standardization (5 year age groups).

Figure 3 presents a different perspective on the practice variation observed in Figure 2 by examining the proportion of in-patient and day surgery rotator cuff repairs performed by hospital corporation. While approximately 87% of provincial rotator cuff repairs were performed in a day surgery setting in fiscal year 2013/14, several hospitals continued to make relatively heavy use of in-patient repairs.

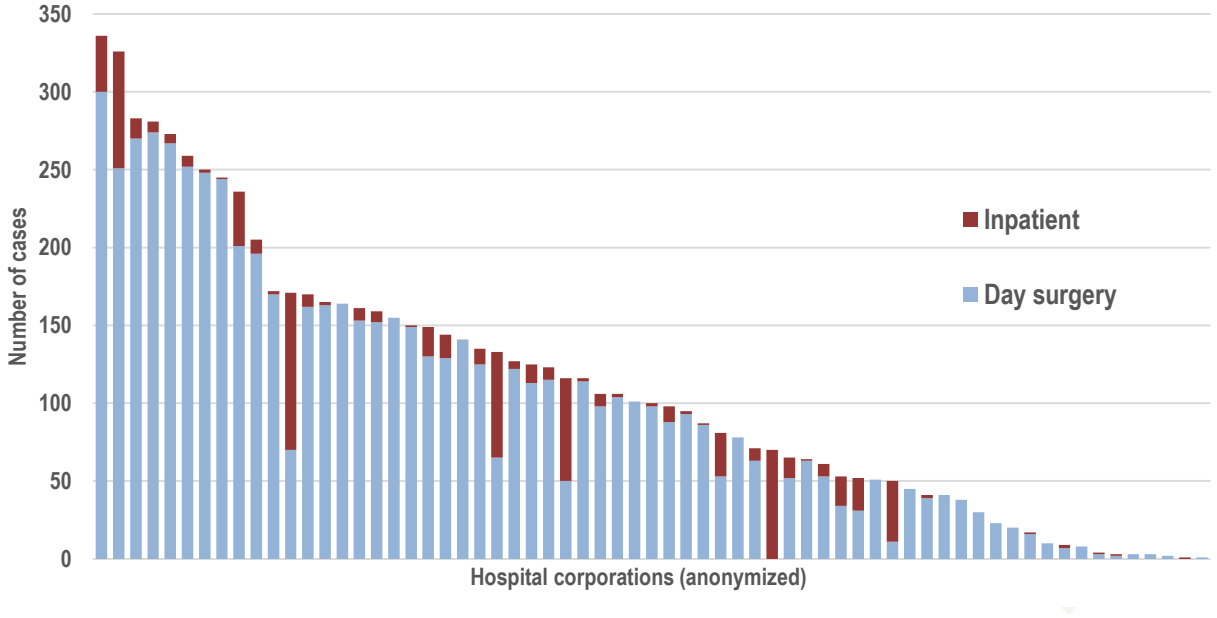

Figure 3: In-patient Versus Day Surgery Rotator Cuff Repairs by Hospital Corporation, Fiscal Year 2013/14

Sources: Canadian Institute for Health Information Portal: Discharge Abstract Database and National Ambulatory Care Reporting System.

Among hospitals that performed shoulder arthroplasty, there was also considerable variation observed in average length of stay. Figure 4 illustrates average length of stay for in-patient shoulder arthroplasties by hospital institution in fiscal year 2013/14.

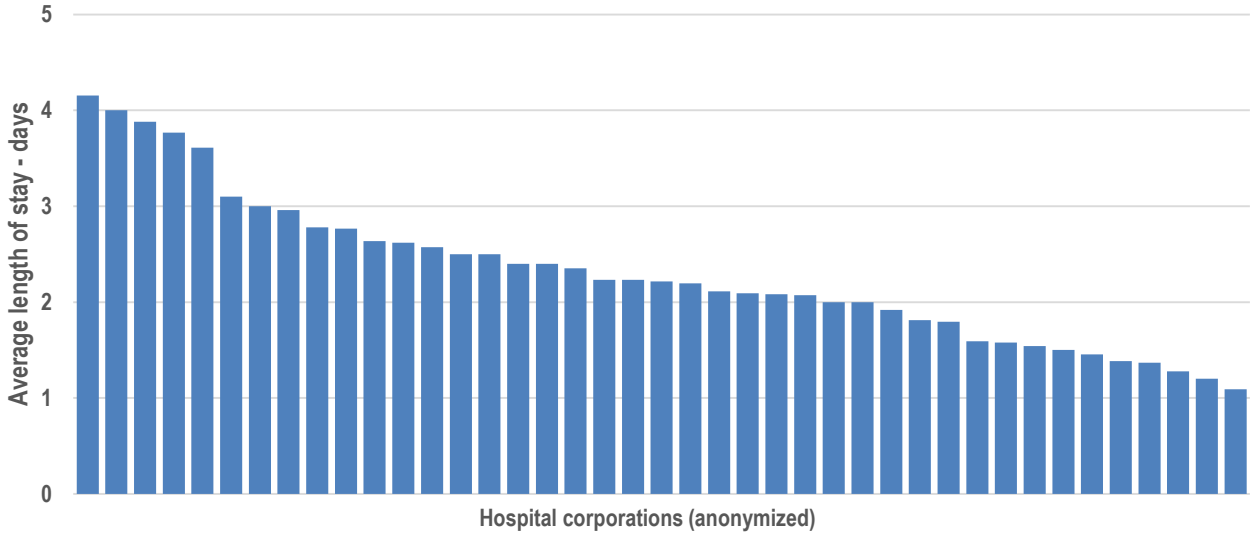

Figure 4: Average Length of Stay for Shoulder Arthroplasty by Hospital, Fiscal Year 2013/14

Source: Canadian Institute for Health Information Portal: Discharge Abstract Database.

6.0 Episode-of-Care Model

The episode-of-care model for degenerative disorders of the shoulder is presented in Figure 5. This model was developed by the expert advisory panel and served as a working model while the components of this clinical handbook were being developed. Beginning as a simplified sketch of key phases in the episode of care (e.g., assessment in primary care, orthopaedic consultation, surgery, follow-up), the model was modified to reflect the elements of the pathway determined by the expert advisory panel.

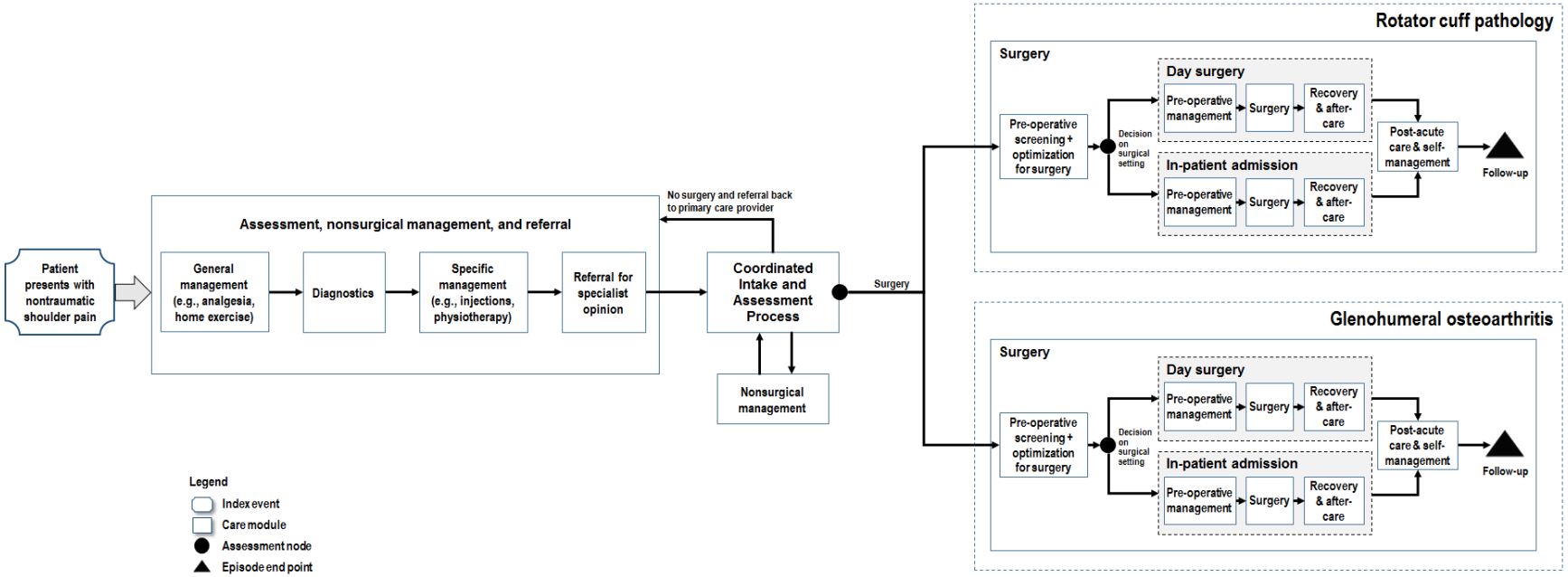

Figure 5: Episode-of-Care Model for Degenerative Disorders of the Shoulder

7.0 Recommended Practices for Degenerative Disorders of the Shoulder

7.1 Sources Used to Develop Recommended Practices

7.1.1 Health Quality Ontario Evidence Reviews and Ontario Health Technology Advisory Committee Recommendations

No Health Quality Ontario evidence reviews or corresponding Ontario Health Technology Advisory Committee recommendations directly evaluated the shoulder episode of care. However, we did consider two Health Quality Ontario clinical handbooks; these did not directly evaluate the shoulder populations but were related to the current episode of care:

- *Quality-Based Procedures: Clinical Handbook for Primary Hip and Knee Replacement* (2013) (16)
- *Quality-Based Procedures: Clinical Handbook for Knee Arthroscopy* (2014) (17)

We considered recommendations from the Health Quality Ontario clinical handbooks for hip and knee replacement and for knee arthroscopy given the similarities of the clinical pathways, and the expert advisory panel determined which recommendations were clinically and contextually relevant.

7.1.2 Health Quality Ontario Rapid Reviews

We conducted rapid reviews on specific topics requested by the expert advisory panel or where we identified gaps or inconsistencies in the evidence:

- *Antibiotic Prophylaxis in Shoulder Surgery*
- *Chlorhexidine-Alcohol Antisepsis as Prophylaxis for Postoperative Infections in Shoulder Surgery*
- *Acromioplasty Versus Conservative Therapy in Patients With Subacromial Impingement Syndrome Who Have Failed Conservative Therapy*
- *Open Versus Mini-open Versus Arthroscopic Rotator Cuff Repair Surgery in Patients With Rotator Cuff Tears*
- *Arthroscopic Debridement for Osteoarthritis of the Glenohumeral Joint*
- *Hemiarthroplasty Compared With Total Arthroplasty in Shoulder Osteoarthritis*
- *Open, Arthroscopic, and Mini-open Rotator Cuff Repair Surgery* (an economic rapid review)

The complete rapid review reports are available in Appendix 2. The conclusions from the rapid reviews are included within each of the episode-of-care modules, with Grading of Recommendations Assessment, Development and Evaluation (GRADE) quality assessments where applicable. As stated by the GRADE Working Group, (18) the final GRADE quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of effect

7.1.3 Clinical Guidelines

Six clinical guidelines were identified that were relevant to the shoulder episode-of-care pathway (Table 3).

Table 3: Clinical Guidelines for Rotator Cuff Pathology and Glenohumeral Osteoarthritis

Author	Year	Title
American Academy of Orthopaedic Surgeons (19)	2009	*Treatment of Glenohumeral Joint Osteoarthritis*
American Academy of Orthopaedic Surgeons (20)	2010	*Optimizing the Management of Rotator Cuff Problems*
American College of Occupational and Environmental Medicine (21)	2011	"Shoulder Disorders"
Bussières et al (22)	2008	"Diagnostic Imaging Guideline for Musculoskeletal Complaints in Adults—An Evidence-Based Approach. Part 2: Upper Extremity Disorders"
National Clinical Guideline Centre—Acute and Chronic Conditions (National Institute for Health and Clinical Excellence) (23)	2010	*Venous Thromboembolism: Reducing the Risk. Reducing the Risk of Venous Thromboembolism (Deep Vein Thrombosis and Pulmonary Embolism) in Patients Admitted to Hospital*
Hopman et al (University of New South Wales, Medicine, Rural Clinical School) (24)	2013	*Clinical Practice Guidelines for the Management of Rotator Cuff Syndrome in the Workplace*

Quality assessments for each of the guidelines using the AGREE II domain scores are presented in Table 4 (arranged by scores for the rigour-of-development domain).

Table 4: AGREE II Domain Scores for Rotator Cuff Pathology and Glenohumeral Osteoarthritis Guidelines

Guideline, Year	AGREE II Domain (Scaled Domain Score %)					
	Scope and Purpose	Stakeholder Involvement	Rigour of Development	Clarity of Presentation	Applicability	Editorial Independence
NICE, 2010 (23)	89	75	**86**	75	68	71
AAOS, 2009 (19)	72	64	**81**	83	0	71
AAOS, 2010 (20)	69	64	**81**	83	0	71
UNSW, 2013 (24)	94	81	**78**	86	46	88
ACOEM, 2011 (21)	67	67	**65**	72	17	38
Bussières et al, 2008 (22)	89	75	**65**	53	58	75

Abbreviations: AAOS, American Academy of Orthopaedic Surgeons; ACOEM, American College of Occupational and Environmental Medicine; AGREE, Appraisal of Guidelines for Research and Evaluation; NICE, National Institute for Health and Clinical Excellence; UNSW, University of New South Wales, Medicine, Rural Clinical School.

The quality assessment tools used by each guideline are summarized in Table 5. The expert advisory panel reviewed the guideline recommendations to inform their recommendations and identify gaps or inconsistencies in the evidence that may have required an evidence review to inform the relevant recommended practices.

Table 5: Evidence Assessments Used by Included Guidelines

Guideline, Year	Levels of Evidence	
NICE, 2010 (23)	1++	High-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
	1+	Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
	1−	Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
	2++	High-quality systematic reviews of case-control or cohort studies, high-quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal
	2+	Well-conducted case-control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal
	2−	Case-control or cohort studies with a high risk of confounding bias or chance and a significant risk that the relationship is not causal
	3	Nonanalytic studies (e.g., case reports, case series)
	4	Expert opinion, formal consensus
AAOS, 2009 (19)	I	High-quality RCT with statistically different results or non-statistically different results but narrow confidence intervals or systematic review of level I RCTs and homogeneous results
	II	Lesser-quality RCT, prospective comparative study, or systematic review of level II studies or level I with inconsistent results
	III	Case-control study, retrospective comparative study, or systematic review of level III studies
	IV	Case series
	V	Expert opinion

Guideline, Year	Levels of Evidence	
AAOS, 2010 (20)	I	High-quality RCT with statistically different results or non-statistically different results but narrow confidence intervals or systematic review of level I RCTs and homogeneous results
	II	Lesser-quality RCT, prospective comparative study, or systematic review of level II studies or level I with inconsistent results
	III	Case-control study, retrospective comparative study, or systematic review of level III studies
	IV	Case series
	V	Expert opinion
UNSW, 2013 (24)	A	≥ 1 level I or several level II studies with low risk of bias and all studies consistent, or inconsistencies can be explained[a]
	B	1 or 2 level II studies with a low risk of bias or a systematic review/several level III studies with a low risk of bias with most studies consistent or inconsistencies can be explained[a]
	C	1 or 2 level III studies with a low risk of bias or level I or II with a moderate risk of bias[a]
	D	Level IV studies or level I to II studies/systematic reviews with a high risk of bias[a]
	Consensus	In the absence of high-quality evidence, the working party used the literature available in combination with the best available clinical expertise and practices to reach a consensus on the recommendation
ACOEM, 2011 (21)	A	Strong evidence base: 2 or more high-quality studies
	B	Moderate evidence base: at least 1 high-quality study or multiple moderate-quality studies relevant to the topic and the working population
	C	Limited evidence base: at least 1 study of moderate quality
	I	Insufficient evidence: evidence is insufficient or irreconcilable
Bussières, 2008 (22)	A	RCTs, meta-analyses, or systematic reviews
	B	Robust experimental or observational studies
	C	Other evidence where the advice relies on expert opinion and has the endorsement of respected authorities

Abbreviations: AAOS, American Academy of Orthopaedic Surgeons; ACOEM, American College of Occupational and Environmental Medicine; NICE, National Institute for Health and Clinical Excellence; RCT, randomized controlled trial; UNSW, University of New South Wales, Medicine, Rural Clinical School.
[a]Level I studies: systematic review of RCTs; level II: RCT(s); level III-1: pseudo-RCT (alternative allocation or other method); level III-2: comparative observational studies; level III-3: observational studies with concurrent controls; level IV: case series with either post-test or pre-test/post-test outcomes.

7.2 Language Used to Reference Relevant Guidelines and Evidence Sources

For clarity and transparency, the following terms were consistently applied to describe how the various evidence sources were used when developing the episode-of-care recommended practices:

Taken from	The best practice recommendation was taken directly from another source
Modified	Minor modifications from the source materials were made when developing the best practice recommendation
Consistent with	The best practice recommendation was consistent with other sources, but wording of the recommendations was developed by the expert advisory panel
Based on expert advisory panel consensus	The best practice recommendation was largely derived from expert advisory panel consensus

7.3 Episode-of-Care Recommended Practices

Several recommendations in the episode-of-care pathway refer to events that may begin or end in different modules. Modules should be considered collectively rather than as individual components. Individual health care networks should work to minimize duplication of efforts.

Recommendations refer to the collective degenerative disorders of the shoulder cohort unless specified in the recommendation. Some recommendations may refer to only patients with rotator cuff pathology or only those with osteoarthritis of the glenohumeral joint.

7.3.1 Module 1: Assessment, Nonsurgical Management, and Referral

Module 1 identifies recommended practices for the initial assessment, nonsurgical management, and referral of patients for specialist opinion.

Recommended Practices		Source (*Level of Evidence*)
1.1	**Clinical Assessment**	
1.1.1	Clinicians should assess patients for shoulder pain. During the assessment, clinicians should look for signs and symptoms that suggest serious pathology. These can include: • Significant trauma with signs and symptoms of a rotator cuff tear • Signs and symptoms of inflammatory arthropathy • Unexplained swelling or deformity • Systemic symptoms • Concurrent or suspected malignancy	Consistent with UNSW (*consensus*) (24) and modified by the expert advisory panel
1.1.2	Early referral is recommended for patients with signs and symptoms suggestive of serious pathology as described above in 1.1.1.	Based on expert advisory panel consensus
1.2	**Nonsurgical Management—Analgesia**	
1.2.1	A multimodal approach to pain management should be employed in the initial treatment of patients with nontraumatic shoulder pain.	Consistent with the WHO analgesic ladder (25) and modified by the expert advisory panel
1.2.2	The risks and benefits of anti-inflammatory medications should be explained to the patients.	Based on expert advisory panel consensus
1.2.3	Any medication should be provided in the context of other patient co-morbidities.	Based on expert advisory panel consensus
1.2.4	Acetaminophen is recommended to treat chronic shoulder pain if there are contraindications to NSAIDs.	Consistent with ACOEM (*insufficient*) (21) and modified by the expert advisory panel
1.2.5	Oral corticosteroids are not recommended for the treatment of nontraumatic shoulder pain.	Based on expert advisory panel consensus
1.3	**Nonsurgical Management—Physiotherapy**	
1.3.1	Low-technology cold therapy and heat therapy for home use are recommended for temporary relief of nontraumatic shoulder pain.	Consistent with ACOEM (*insufficient*) (21) and modified by the expert advisory panel
1.3.2	Home exercise is recommended for all patients with nontraumatic shoulder pain.	Based on expert advisory panel consensus

Recommended Practices		Source (*Level of Evidence*)
1.4	**Diagnostics and Radiography**	
1.4.1	Radiography is recommended: • For the evaluation of nontraumatic shoulder pain if symptoms persist after at least 4 weeks of nonsurgical management • When there are signs and symptoms that suggest serious pathology; these can include: o Significant trauma with signs and symptoms of a rotator cuff tear o Signs and symptoms of inflammatory arthropathy o Unexplained swelling or deformity o Systemic symptoms o Concurrent or suspected malignancy	Consistent with Bussières et al (*B*) (22) and modified by the expert advisory panel
1.4.2	If radiography is indicated, a true anteroposterior (AP) view and either a trans-scapular or axillary view are sufficient.	Based on expert advisory panel consensus
1.4.3	Advanced imaging (e.g., CT, MRI, ultrasound) is not initially indicated in patients with nontraumatic shoulder pain.	Based on expert advisory panel consensus
1.4.4	Ultrasound may be performed at the same time as radiography in patients with nontraumatic shoulder pain who have not progressed with nonsurgical management.	Consistent with ACOEM (*insufficient*) (21) and modified by the expert advisory panel
1.4.5	The ultrasound examination should be ordered by the referring physician and the results made available for the specialist.	Based on expert advisory panel consensus
1.5	**Nonsurgical Management—Corticosteroid Injections**	
1.5.1	Corticosteroid injections are recommended in patients with persistent nontraumatic shoulder pain who have not improved with other modalities of conservative therapy.	Consistent with UNSW (*A*) (24) and ACEOM (*B*) (21) and modified by the expert advisory panel
1.5.2	There is insufficient evidence to recommend for or against the use of injectable corticosteroids in the treatment of glenohumeral joint arthritis. The decision to treat should be left to the discretion of medical practitioners.	Consistent with AAOS (*insufficient*) (19) and modified by the expert advisory panel
1.6	**Process for Referral**	
1.6.1	Referral for specialist opinion is recommended in patients with significant activity limitation and participation restrictions or persistent shoulder pain following engagement in an active, nonsurgical treatment program for 3 months.	Consistent with UNSW (*consensus*) (24) and modified by the expert advisory panel
1.6.2	Referral for specialist opinion is recommended for patients with a documented symptomatic full-thickness rotator cuff tear.	Consistent with UNSW (*B; consensus*) (24) and modified by the expert advisory panel

Recommended Practices		Source (*Level of Evidence*)
1.6.3	Referral for specialist opinion is recommended for patients with radiographic evidence of degenerative arthritis of the glenohumeral joint.	Based on expert advisory panel consensus
1.6.4	The primary care provider should make the referral for surgery consultation and be the coordinator of patient care.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
1.6.5	Referrals should be made using a standardized template that includes the reason for referral, radiographs, ultrasounds, and relevant patient co-morbidities.	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel

Abbreviations: AAOS, American Academy of Orthopaedic Surgeons; ACOEM, American College of Occupational and Environmental Medicine; CT, computed tomography; HQO, Health Quality Ontario; MRI, magnetic resonance imaging; NSAID, nonsteroidal anti-inflammatory drug; UNSW, University of New South Wales, Medicine, Rural Clinical School; WHO, World Health Organization.

Implementation Considerations	
Potential barriers	• Currently, there is no standardized provincial referral pathway or template for shoulder-related symptoms (e.g., a pathway or template embedded in PHC EHRs), making standardized workup and referral by the family physician difficult. • Variation in the quality of imaging across ultrasonography providers can lead to specialists re-ordering imaging. • Concerned patients may put pressure on primary care practitioners to order unnecessary imaging. • There are long waits for patients to access specialists in many parts of the province; it is difficult for primary care practitioners to obtain information on the next available surgeon to enable quick access.
Potential levers	• The ministry should work with provincial primary care and orthopaedic organizations to develop a standardized PHC referral template, including appropriate diagnostic imaging, for patients with persistent shoulder pain; this should be disseminated to primary care practitioners through provincial organizations and by orthopaedic surgeons. • The ministry should implement coordinated intake and assessment process models to reduce waits for specialists and reduce unnecessary imaging. • The ministry should provide information to primary care practitioners on Wait 1 times (the time between the referral date and the date of surgeon consultation) and Wait 2 times (the time between the decision to perform surgery and the date of surgery) for shoulder specialists (e.g., through Access to Care).

Abbreviations: EHR, electronic health record; PHC, primary health care.

7.3.2 Module 2: Coordinated Intake and Assessment Process

Module 2 describes the recommendations related to the coordinated intake and assessment process of patients referred from primary care.

Recommended Practices		Source (*Level of Evidence*)
2.1	**Coordinated Intake and Assessment Process**	
2.1.1	Surgical referrals should be managed through a coordinated intake and assessment process: • The process should be flexible and allow primary care providers to refer patients to a specific surgeon or hospital, or to the next available surgeon or hospital. The process should also allow *patients* to choose a specific surgeon or hospital, or the next available surgeon or hospital when there are differences in wait times across the system • Patients should be seen within the provincial wait time target; however, they should be allowed to wait beyond the wait time target for a particular hospital or surgeon, if that is their preference • There are multiple models and structures of coordinated intake and assessment processes currently in place in Ontario. Hospitals and local health care centres should be allowed to select their preferred method of coordinated intake as long as the criteria listed above are satisfied	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel
2.1.2	Patient assessments should be completed by an appropriate health care practitioner qualified and trained to assess patients and to make decisions regarding the appropriateness of surgeon consultation or surgery: • Assessments should include an evaluation of patient history and co-morbidities • Patients who are not candidates for surgery should be referred for nonsurgical management	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel
2.1.3	All patients should be evaluated using a valid outcome measure for functional assessment.	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel

Recommended Practices		Source (*Level of Evidence*)
2.2	**Diagnostics and Radiography**	
2.2.1	Diagnostic arthroscopy should not be routinely used for the evaluation of patients with a rotator cuff tear when subsequent open surgery is planned.	Based on expert advisory panel consensus
2.2.2	MRI is recommended as the preferred test to assess the size of a rotator cuff tear in patients for whom surgery is considered.	Based on expert advisory panel consensus

Abbreviations: HQO, Health Quality Ontario; MRI, magnetic resonance imaging.

Implementation Considerations	
Potential barriers	• Many shoulder specialists continue to have long Wait 1 and Wait 2 times; shoulder disorders and surgery are not as high a priority for timely access as are other orthopaedic procedures such as joint replacement. • Currently, there is no standardized provincial approach to coordinated intake and assessment for shoulder disorders; there is an absence of these centres in much of the province, and there is variation in efficiency in existing centres (e.g., many centres still require physicians to assess all patients). • There is a potential for concerns among some physicians and patients about non-physician health professionals performing initial patient assessments and determining patient candidacy for surgery. • There is no standard shoulder functional assessment currently in use across the province. This makes it difficult to compare patient populations and outcomes.
Potential levers	• Hospital-specific Wait 2 data should be reported in the Wait Time Information System. Hospital- and surgeon-specific Wait 1 and 2 data should be collected by Access to Care (Cancer Care Ontario). Hospitals and surgeons should use these data for comparative purposes and to inform performance improvement plans. Patients and referring physicians should use these data to inform decision-making. • Regional coordinated intake and assessment centres can help reduce wait times for specialist care by asking patients and primary care practitioners to request referral to either the next available surgeon or a specific surgeon. These centres can also ensure that patients receive consistent functional assessments and consistent assessment for surgical candidacy, and are presented with similarly comprehensive information on alternative treatment choices, regardless of where they live. • There are opportunities for shoulder coordinated intake and assessment centres to integrate with or use coordinated intake and assessment for other musculoskeletal conditions (e.g., the Inter-professional Spine Assessment and Education Clinics model for low back pain) to realize economies of scale and scope. • While the centralized assessment process is preferred, a decentralized approach may also be used with the understanding that the specialist assessment must be completed by a qualified and trained health professional within a particular timeframe.

7.3.3 Module 3: Decision Regarding Surgical Treatment—Clinical Assessment Node

Module 3 represents the clinical assessment node where decisions are made regarding whether patients will receive surgical treatment. If it is determined that surgery is not appropriate, patients return back to their primary care practitioners or remain under the care of specialists to continue with the nonsurgical management described in previous modules.

Recommended Practices	Source (*Level of Evidence*)
3.1 Patients need to be assessed by a surgeon to make the final decision regarding appropriateness for surgery.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
3.2 The risks and benefits of surgery should be explained to the patient, and the patient should be charged with the decision whether or not to proceed with surgery.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
3.3 If it is determined that surgery is not appropriate for patients, the coordinated intake and assessment process should provide "outbound" care back to the appropriate health care provider: • The coordinated intake and assessment process should provide an appropriate care plan for the management of nonsurgical patients, which should include patient education as well as physician instructions such as criteria for return to the intake system	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel
3.4 The coordinated intake and assessment process should ensure that nonsurgical options are explained to patients.	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel
3.5 Results of the assessment and plan for treatment should be communicated back to patients' primary care providers. The report should include the proposed care plan and education materials, and it should be sent to the primary care provider within 2 working days of the completed assessment. The report should also include instructions regarding access to reassessment should a patient's condition worsen.	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel
3.6 For surgical candidates, a report should be generated and sent to the surgeon prior to surgical consultation and ideally within 2 working days of the assessment.	Based on expert advisory panel consensus

Abbreviation: HQO, Health Quality Ontario.

Implementation Considerations	
Potential barriers	• Wide regional variation in age- and sex-adjusted shoulder surgery rates suggests inconsistency across the province in surgical candidacy criteria. • Patients in many parts of the province experience challenges being informed of and accessing nonsurgical treatments (physiotherapy, injections, etc.). • There is an absence of coordinated intake and assessment process models to provide one point of access for consistent assessment, triage, and treatment options.

Potential levers	• The ministry should establish provincial coordinated intake and assessment processes to assess and triage patients according to standardized criteria.
	• The ministry should establish a web-based tool to provide patients with information on the availability of surgeons for each type of shoulder procedure. The current Wait Time Information System website (http://www.ontariowaittimes.com/) is limited to information on wait times at the hospital level and groups all shoulder procedures together. Some shoulder procedures (e.g., reverse shoulder arthroplasty) are likely to have significantly longer wait times than others (e.g., rotator cuff repair).
	• Patient decision aids may be helpful tools to ensure that patients receive consistent, evidence-based information. For example, see the Ottawa Hospital Research Institute decision aid web clearinghouse for shoulder disorders:
	  ○ Rotator cuff decision aid: http://decisionaid.ohri.ca/AZsumm.php?ID=1107
	  ○ Shoulder osteoarthritis decision aid: http://decisionaid.ohri.ca/AZsumm.php?ID=1341
	• For nonsurgical patients, a coordinated intake and assessment process can provide information on nonsurgical treatment options including physiotherapy, exercise programs, and alternative forms of pain management. The coordinated intake and assessment process can include individualized care plans and educations materials that take into account lifestyle and access to community services.
	• Health professionals can provide feedback and teaching materials for patients on current physical status and pain intensity, a suggested physical plan to reduce pain, and strategies to increase mobility while either awaiting surgery (pre-surgical care plan) or receiving nonsurgical treatment.

7.3.4 Module 4: Pre-operative Screening

Module 4 identifies recommended practices for the assessment and medical testing of patients who have been identified as surgical candidates, prior to their shoulder surgery. This module also covers pre-operative patient planning, which includes patient education, provisional discharge planning, and lifestyle and behaviour modifications.

Recommended Practices		Source (*Level of Evidence*)
4.1	**Pre-operative Assessment**	
4.1.1	Pre-operative assessment clinic visits are necessary and should be conducted in an appropriate timeframe prior to the surgery date to avoid unnecessary cancellations and improve efficiency.	Consistent with the HQO clinical handbook for knee arthroscopy (17) and modified by the expert advisory panel
4.1.2	All patients scheduled to undergo shoulder surgery should be evaluated using a valid outcome measure for functional assessment.	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel
4.2	**Pre-operative Medical Testing**	
4.2.1	Routine medical testing is not required unless indicated during the pre-operative assessment or additional information from the tests would inform clinical decision-making.	Consistent with the HQO clinical handbook for knee arthroscopy (17) and modified by the expert advisory panel
4.3	**Appropriateness of Day Surgery**	
4.3.1	In patients undergoing rotator cuff surgery, the surgeon or anaesthesiologist should determine the appropriateness for day surgery versus in-patient admission, taking patient medical status into consideration.	Consistent with the HQO clinical handbook for knee arthroscopy (17) and modified by the expert advisory panel
4.3.2	In patients with shoulder arthritis, shoulder arthroplasty may be done on an outpatient basis in certain select circumstances based on the discretion of medical practitioners.	Based on expert advisory panel consensus
4.3.3	Standardized medical assessment tools should be used to determine clinical conditions that identify patients who require an in-patient admission.	Taken from the HQO clinical handbook for knee arthroscopy (17)
4.4	**Preparation for Surgery**	
4.4.1	Preparation for surgery should occur with adequate time before surgery to address modifiable patient risk factors.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)

Recommended Practices		Source (*Level of Evidence*)
4.5	**Discharge Planning**	
4.5.1	Patients must fit institutional criteria for discharge. Discharge planning should begin at the time of the decision to treat: • The patient's home should be prepared for their safe return and recovery following acute care. • The availability of support persons to assist the patient before and after surgery should be identified.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
4.6	**Patient Education**	
4.6.1	Patients should receive education addressing the entire continuum of care.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
4.7	**Lifestyle and Behaviour Modification**	
4.7.1	Lifestyle or behaviour modification may be necessary before surgery to optimize the benefits and reduce the risks of surgery.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
4.7.2	Smoking cessation counselling prior to surgery should be recommended for people who smoke.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
4.7.3	Patients' pre-existing pain management regimens should be assessed.	Based on expert advisory panel consensus
4.7.4	For patients with chronic pain concerns or who are not opioid naive, the pre-existing pain management regimen should be assessed to determine their postoperative pain management needs.	Based on expert advisory panel consensus
4.7.5	Patients should continue with any existing pre-operative home exercise program while waiting for surgery.	Based on expert advisory panel consensus

Abbreviation: HQO, Health Quality Ontario.

Implementation Considerations	
Potential barriers	• There is currently no standardized provincial pre-operative assessment template or patient education package. • Some patients may not be sufficiently self-motivated to make optimal lifestyle changes. • Some Ontario hospitals continue to have very high rates of in-patient utilization for rotator cuff repairs and other repairs that can be safely performed on an outpatient basis. It has been suggested that provincial restrictions around eligibility for OHIP-funded physiotherapy (patients require an overnight stay to be eligible) may be partially responsible for some hospitals' high rates.
Potential levers	• Hospitals should use provincial data comparing hospital in-patient versus day surgery utilization rates for lower-complexity shoulder procedures (e.g., rotator cuff repairs) to benchmark and compare hospital performance; hospitals with relatively high rates of in-patient utilization should investigate and make appropriate changes in practice (e.g., pain management practices). • Refer to past OHTAC recommendations on pre-operative consultations (http://www.hqontario.ca/Portals/0/documents/eds/recommendation-pre-op-consult-140305-en.pdf), pre-operative resting echocardiography (http://www.hqontario.ca/Portals/0/documents/eds/recommendation-rest-echocardiography-140305-en.pdf), and pre-operative cardiac stress tests (http://www.hqontario.ca/Portals/0/documents/eds/recommendation-stress-test-140305-en.pdf). • Refer to Choosing Wisely Canada recommendations regarding potentially unnecessary pre-operative tests (http://www.choosingwiselycanada.org/).

Abbreviations: OHIP, Ontario Health Insurance Plan, OHTAC, Ontario Health Technology Advisory Committee.

7.3.5 Module 5: Pre-operative Management

Module 5 identifies recommended practices for patient screening and optimization before hospital admission, with the aim of ensuring safe medical preparation for surgery.

Recommended Practices		Source (*Level of Evidence*)
5.1	**Pre-admission screening**	
5.1.1	Pre-admission screenings should be conducted in an appropriate timeframe before surgery to avoid empty operating room time due to late cancellations.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
5.2	**Patient Optimization**	
5.2.1	Patients should be medically optimized before elective surgery.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
5.3	**Specific Investigations**	
5.3.1	Specific investigations for medical preparation should follow evidence-based best practices.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
5.4	**Clinical Care Pathway**	
5.4.1	Hospitals should use a structured clinical care pathway for in-patient surgeries: • Care maps should be used with clinical judgment as adjustment may be required for a subset of the population that is unable to meet criteria due to co-morbidities or postoperative adverse events	Taken from the HQO clinical handbook for primary hip and knee replacement (16)

Abbreviation: HQO, Health Quality Ontario.

Implementation Considerations	
Potential barriers	• Not all hospitals have a structured clinical pathway.
Potential levers	• Hospitals without a clinical pathway should leverage the recommendations in this handbook to adopt an existing evidence-based pathway or develop a new one. • Refer to past OHTAC recommendations on pre-operative consultations (http://www.hqontario.ca/Portals/0/documents/eds/recommendation-pre-op-consult-140305-en.pdf), pre-operative resting echocardiography (http://www.hqontario.ca/Portals/0/documents/eds/recommendation-rest-echocardiography-140305-en.pdf), and pre-operative cardiac stress tests (http://www.hqontario.ca/Portals/0/documents/eds/recommendation-stress-test-140305-en.pdf).

Abbreviation: OHTAC, Ontario Health Technology Advisory Committee.

7.3.6 Module 6: Surgery

Module 6 identifies recommended practices for shoulder surgery. The module includes recommendations for surgical safety, the choice of appropriate anaesthesia, and the prevention of infections and venous thromboembolisms.

Recommended Practices		Source (*Level of Evidence*)
6.1	**Perioperative Interventions**	
6.1.1	Low-technology cold therapy may be recommended for home use for the relief of perioperative shoulder pain.	Consistent with ACOEM (*insufficient*) (21) and modified by the expert advisory panel
6.1.2	There is insufficient evidence to recommend for or against the use of perioperative nonsteroidal anti-inflammatory drugs (NSAIDs) in patients undergoing rotator cuff surgery.	Consistent with AAOS (*insufficient*) (20) and modified by the expert advisory panel
6.1.3	The decision regarding perioperative NSAID use in patients undergoing shoulder arthroplasty should be left to the discretion of medical practitioners.	Based on expert advisory panel consensus
6.2	**Surgical Safety**	
6.2.1	The WHO surgical safety checklist, (26) in addition to other surgical safety tools and supports, should be referenced prior to surgery.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
6.3	**Anaesthesia**	
6.3.1	The choice of anesthesia should involve anaesthesiologists and surgeons, as well as patient preference.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
6.4	**Infection Prevention**	
6.4.1	Routine antibiotic administration is recommended no earlier than 30 minutes prior to the initiation of the surgery as prophylaxis against infection in patients receiving implanted materials.	Based on expert advisory panel consensus; no evidence was identified by an HQO rapid review on the effectiveness of antibiotic prophylaxis in patients undergoing shoulder surgeries (Appendix 2)
6.4.2	The use of chlorhexidine wash for surgical site infection prevention is recommended in patients undergoing open shoulder surgeries.	Based on expert advisory panel consensus, and insufficient evidence identified by an HQO rapid review on the effectiveness of chlorhexidine in reducing postoperative infections and rates of bacterial culture (Appendix 2)

Recommended Practices		Source (*Level of Evidence*)
6.5	**VTE Prevention**	
6.5.1	For patients undergoing shoulder surgery who do not have a history of prior VTE, no thromboprophylaxis is recommended unless the patient has additional VTE risk factors.	Consistent with NICE (*consensus*) (23) and modified by the expert advisory panel
6.6	**Diagnostics and Radiography**	
6.6.1	Diagnostic arthroscopy should not be routinely used for the evaluation of patients with a rotator cuff tear when subsequent open surgery is planned.	Based on expert advisory panel consensus
6.7	**Type of Surgery**	
6.7.1	There is insufficient evidence to recommend for or against the routine use of acromioplasty in patients with subacromial impingement syndrome for whom conservative therapy has failed.	Based on an HQO rapid review on the effectiveness of acromioplasty (Appendix 2)
6.7.2	There is insufficient evidence to recommend a preferred surgical approach (arthroscopic, open, or mini-open) in patients for whom rotator cuff repair surgery is indicated.	Based on an HQO rapid review on the effectiveness of open, mini-open, and arthroscopic rotator cuff repair surgery (Appendix 2)
6.7.3	There is insufficient evidence to recommend the routine use of arthroscopic debridement in patients with arthritis of the glenohumeral joint.	Based on an HQO rapid review on the effectiveness of debridement in the treatment of patients with osteoarthritis of the glenohumeral joint (Appendix 2)
6.7.4	Total shoulder arthroplasty and hemiarthroplasty are options when treating patients with glenohumeral joint osteoarthritis.	Consistent with AAOS (*IV and V*) (19) and an HQO rapid review on the effectiveness and safety of hemiarthroplasty compared with total shoulder arthroplasty in the treatment of shoulder osteoarthritis (Appendix 2), and modified by the expert advisory panel
6.7.5	Patients with diffuse degenerative joint disease whether osteoarthritis, rheumatoid arthritis, or other cause are generally good candidates for total joint arthroplasty, although some may be candidates for hemiarthroplasty.	Taken from ACOEM (*B*) (21)
6.7.6	The choice of surgery type to be used when treating patients with glenohumeral joint osteoarthritis should be left to the discretion of medical practitioners.	Based on expert advisory panel consensus

Recommended Practices		Source (*Level of Evidence*)
6.8	**Technical Aspects of Surgery**	
6.8.1	Individual hospitals should develop and implement an implant-matching program, where appropriate prostheses are determined based on best available, current evidence applied to individual patient characteristics.	Taken from the HQO clinical handbook for primary hip and knee replacement (16)
6.8.2	There is insufficient evidence to recommend for or against a specific type of humeral prosthetic design or method of fixation when performing shoulder arthroplasty in patients with glenohumeral joint osteoarthritis.	Consistent with AAOS (*insufficient*) (19) and modified by the expert advisory panel
6.8.3	The type of implant to be used in shoulder arthroplasty should be left to the discretion of medical practitioners and based on specific patient characteristics.	Based on expert advisory panel consensus

Abbreviations: AAOS, American Association of Orthopaedic Surgeons; ACOEM, American College of Occupational and Environmental Medicine; HQO, Health Quality Ontario; NICE, National Institute for Health and Clinical Excellence; NSAID, nonsteroidal anti-inflammatory drug; VTE, venous thromboembolism; WHO, World Health Organization.

Implementation Considerations	
Potential barriers	• Many hospitals do not have an implant-matching program for shoulder procedures, and this leads to unnecessary variation in devices and costs. • The body of evidence around long-term survival and other outcomes with shoulder prostheses is not as developed as that for hip and knee prostheses. • The cost of some shoulder implants (e.g., for reverse shoulder arthroplasty) may be prohibitive for some hospitals. • Many hospitals have not formally planned the types of shoulder procedures they deliver (e.g., arthroscopic vs. open, in-patient vs. day surgery).
Potential levers	• The hospital orthopaedic department should develop a shoulder surgical checklist and update it on a regular basis. • The ministry should establish evidence-based patient eligibility criteria for different types of shoulder procedures to ensure the appropriate use of more expensive procedures (e.g., reverse shoulder arthroplasty).

7.3.7 Module 7: Recovery and After-Care

Module 7 identifies recommended practices for patient recovery after surgery and emphasizes the need for appropriate postoperative pain management. These recommendations may overlap with or be applied within earlier modules.

Recommended Practices		Source (*Level of Evidence*)
7.1	**Pain Management**	
7.1.1	The decision for pain management modalities should include consideration of the complexity of surgery and the clinical presentation. A multimodal approach to postoperative pain management should be employed.	Taken from the HQO clinical handbook for knee arthroscopy (17)
7.1.2	For patients with chronic pain concerns or who are not opioid naive, the pre-existing pain management regimen should be assessed to determine their postoperative pain management needs.	Based on expert advisory panel consensus
7.1.3	Interscalene brachial plexus nerve blockade for pain management after shoulder surgery should be considered as part of a multimodal approach.	Based on expert advisory panel consensus
7.1.4	Continuous interscalene brachial plexus blockade via catheter infusion may be considered if pain is expected to be high and for prolonged periods of time in patients who have undergone rotator cuff surgery.	Based on expert advisory panel consensus
7.1.5	Continuous interscalene brachial plexus blockade via catheter infusion should be considered if pain is expected to be high and for prolonged periods of time in patients who have undergone shoulder arthroplasty.	Based on expert advisory panel consensus

Abbreviation: HQO, Health Quality Ontario.

Implementation Considerations	

Potential barriers	• Inadequate pain control is one of the main barriers to early discharge.
	• Not all hospitals have the expertise and infrastructure required to offer regional anaesthesia (e.g., interscalene brachial plexus nerve blocks and catheters):
	  ○ Expertise in provision of interscalene nerve blocks
	  ○ Need for a separate regional anaesthesia "block room"
	  ○ Assistance for the anaesthesiologist in performing the nerve blocks
	  ○ Infrastructure for ultrasound-guided regional anaesthesia
	  ○ Follow-up care for patients discharged with interscalene catheters in situ

Potential levers	• The use of regional anaesthesia can promote earlier discharge of patients. Appropriate resources should be made available for the administration and follow-up care of those receiving regional anaesthesia (e.g., discharged from hospital with catheter) to make earlier discharge possible. • The ministry should set length-of-stay targets for shoulder arthroplasty using provincial benchmarks. • Hospitals should provide education to patients and family members on all factors for postsurgical recovery, including information on pain medication side effects and how to identify early adverse reactions to medication.

7.3.8 Module 8: Post-acute Care

Module 8 describes recommended practices for further pain management and rehabilitation after surgery.

Recommended Practices		Source (*Level of Evidence*)
8.1	**Pain Management**	
8.1.1	A multimodal approach to postoperative pain management should be employed in the post-acute stage.	Based on expert advisory panel consensus
8.2	**Rehabilitation**	
8.2.2	A supervised outpatient postoperative physiotherapy program, supplemented by home exercise provided by the hospital at discharge, is recommended for patients who have undergone rotator cuff surgery or shoulder arthroplasty.	Based on expert advisory panel consensus; the expert advisory panel recommends that HQO undertake an evidence-based analysis on postoperative physiotherapy in patients who have undergone rotator cuff surgery or shoulder arthroplasty
8.2.3	Low-technology cold therapy is recommended to relieve pain after rotator cuff surgery or shoulder arthroplasty.	Consistent with AAOS (*none*) (20) and modified by the expert advisory panel
8.2.4	Slings and shoulder supports are recommended for postoperative pain after rotator cuff surgery or shoulder arthroplasty.	Consistent with ACOEM (*insufficient*) (21) and modified by the expert advisory panel
8.3	**Follow-Up Plan**	
8.3.1	Before discharge, patients should be instructed to book a follow-up appointment with their primary care provider.	Based on expert advisory panel consensus
8.3.2	A discharge summary (care plan, medications, follow-up appointment) should be sent to the primary care provider on the day of discharge, with a full discharge letter to follow.	Based on expert advisory panel consensus

Abbreviations: AAOS, American Association of Orthopaedic Surgeons; ACOEM, American College of Occupational and Environmental Medicine; HQO, Health Quality Ontario.

Implementation Considerations	
Potential barriers	• There is significant variation in access to and types of publically funded rehabilitation programs available to Ontarians, depending on geography. • Post-discharge rehabilitation services through CCACs are not available in all LHINs. • There are no consistent criteria for rehabilitation-related patient outcome measures (e.g., range of motion). • Hospitals are not required to report on outpatient rehabilitation clinic activity. This is a significant gap in current provincial information systems; many patients in this cohort may use only outpatient rehabilitation clinics. • Not all patients receive a structured home exercise program as a component of the discharge plan.
Potential levers	• Contents of rehabilitation programs for specific shoulder populations should be standardized so that all patients in the province receive standardized options. Programs can refer to the rehabilitation guidelines developed for Sunnybrook Health Sciences and for Alberta. • Hospitals should ensure patients receive a home exercise program as a component of discharge planning. • Hospitals should develop postoperative patient exercise education materials that are consistent, easily understood, and used by all health providers.

Abbreviations: CCAC, community care access centre; LHIN, local health integration network.

7.3.9 Module 9: Follow-Up

Module 9 identifies recommended practices for the follow-up period after surgery.

Recommended Practices		Source (*Level of Evidence*)
9.1	**Follow-Up Care**	
9.1.1	Patients should be assessed by the treating surgeon within 6 weeks of the surgical procedure.	Based on expert advisory panel consensus
9.1.2	All patients should be evaluated using a valid outcome measure for functional assessment.	Consistent with the HQO clinical handbook for primary hip and knee replacement (16) and modified by the expert advisory panel
9.2	**Return to Work or Activity**	
9.2.1	The decision to return to work or activities should be made by surgeons and patients.	Based on expert advisory panel consensus

Abbreviation: HQO, Health Quality Ontario.

Implementation Considerations	
Potential barriers	• Some surgeons or hospitals routinely wait until a point in time after the surgery to book follow-up appointments, which may lead to delays and missed appointments.
Potential levers	• Postsurgery follow-up appointments should be booked prior to surgery dates. This practice has been identified as effective for improving the consistency and timeliness of follow-up. • Follow-up assessments provide an opportunity to assess patients' improvement versus their baseline, using a validated functional outcome scale.

8.0 Implementation of Best Practices

8.1 System-Wide Considerations

The Expert Advisory Panel on Degenerative Disorders of the Shoulder agreed that the following three steps are priority areas for the effective implementation of the best practices described in this clinical handbook:

1. Establish in every region of Ontario a coordinated intake and assessment process for patients with degenerative shoulder disorders that provides an effective and efficient referral pathway between primary and secondary care
2. Continue to shift non-arthroplasty shoulder procedures from in-patient to outpatient settings when safe to do so
3. Develop and deploy "bundled" funding models for the integrated management of patients with shoulder disorders; these models would include community-based assessment and triage (through a coordinated intake and assessment process), acute care, and postoperative rehabilitation

8.1.1 Establish Regional Coordinated Intake and Assessment Processes

For patients with degenerative shoulder disorders, few regions in Ontario currently have efficient and effective pathways between primary and secondary care for referral, assessment, and triage to appropriate treatment. In the absence of appropriate referral pathways, far too many patients (a) receive unnecessary and costly diagnostic imaging services, and (b) experience lengthy waits to see busy orthopaedic shoulder specialists, only to be informed they are not candidates for surgery.

The expert advisory panel recommended the implementation of regional coordinated intake and assessment processes for shoulder disorders. Coordinated intake and assessment models are currently in place in several regions of the province for patients with hip and knee osteoarthritis, and these models help to streamline referral processes, make better use of existing capacities, reduce patients' wait times for an orthopaedic assessment, and reduce the unnecessary use of diagnostic imaging. The core elements of a coordinated intake and assessment process include these:

- **There should be a "single intake" system for managing primary care referrals for shoulder disorders**—Ideally, all primary care practitioners in a region would have (and be aware of) a single centre where they can direct referrals for patients with degenerative shoulder disorders who are deemed to be candidates for referral (using the criteria specified in module 1 of this clinical handbook). Primary care practitioners should be provided with standardized referral forms and criteria to ensure that secondary care providers receive consistent information around each patient. Recognizing that redirecting the referral practice of all primary care practitioners in a region is a significant challenge, an intermediate solution is to ensure that all orthopaedic surgeons in a particular hospital (or group of hospitals) direct to a regional referral management system all referrals they receive for patients with shoulder disorders. Coordinated intake and assessment centres should also consider incorporating capacity to enable physician e-consultations
- **There should be a coordinated multidisciplinary approach to a comprehensive standardized assessment by a qualified health care practitioner(s)**—Once referred to a regional referral

management system, patients with degenerative shoulder disorders should be directed to a comprehensive assessment. Assessments may be undertaken through a central or decentralized approach, depending on local needs. In the interests of health system cost-efficiency and optimal management of the capacity of busy orthopaedic surgeons, initial assessments of referred patients should be conducted by non-physician health professionals with specialty expertise in musculoskeletal and shoulder disorders (e.g., advanced practice physiotherapists)

- **Patients deemed to be surgical candidates after assessment should be provided with the choice of next available hospital or surgeon in their region, or a particular hospital or surgeon, if desired**—Patients should be provided with wait time information on the hospitals and surgeons within their region to inform their choice
- **Coordinated intake and assessment centres should provide patient education and either offer or triage patients (particularly nonsurgical) to outbound care**—The expert advisory panel identified a system-wide problem: patients with shoulder pain who are deemed in specialist consultations to be nonsurgical candidates are "dumped" back on unprepared primary care practitioners. Coordinated intake and assessment centres should support referring primary care practitioners by offering patient education and providing or arranging outbound care for nonsurgical candidates

8.1.2 Continue to Shift Non-arthroplasty Shoulder Procedures From In-patient to Outpatient Settings When Safe to Do So

Outside of the more complex shoulder arthroplasty patient subgroup, the majority of shoulder procedures can be performed safely and effectively on an outpatient basis, particularly repairs of the rotator cuff and shoulder joint. Although the majority of Ontario hospitals perform most of these cases on an outpatient basis, there are a small group of hospitals that continue to perform high rates of in-patient rotator cuff repairs and other less complex procedures. These cases make inefficient use of hospital capacity, increase costs unnecessarily, and may put patients at increased risk for hospital-acquired infections.

It is recommended that hospitals review their rates of in-patient utilization for non-arthroplasty shoulder procedures and compare these rates against those of their peers. Hospitals with comparatively high rates of in-patient utilization should review their care pathways and pain management protocols, and implement process changes to redirect these procedures to the outpatient setting.

8.1.3 Develop and Deploy Integrated Funding Models for Shoulder Care

Without a supportive provider funding model, it will not be possible to create the right financial environment to promote appropriate transitions of patients with shoulder disorders from primary to secondary and acute care, and then from acute to post-acute care. In the current system, funding for these sectors sits in disconnected silos, preventing health care professionals from achieving overall improvements in patient outcomes and costs across these settings. Current financial incentives work against the development of integrated models of shoulder care, such as coordinated intake and assessment process models.

8.2 Regional-Level Considerations

Local health integration networks (LHINs) should take a lead in promoting orthopaedic communities of practice at the regional level to foster the uptake of recommendations in this clinical handbook. This can be accomplished by:

- Engaging clinicians throughout the development, implementation, and monitoring process to ensure appropriate communications and processes
- Developing a monitoring process that measures the implementation progress of the clinical practices recommended here

8.2.1 Provision of Administrative Data

The ministry and LHINs should work to obtain and provide data for providers around utilization and access to shoulder care. Ideally, these would include data around the care of patients with shoulder disorders in primary care, not just hospital care; however, such information is difficult to come by in Ontario. Administrative data should be consistent with ministry reports. The baseline data should then be communicated to providers of shoulder surgery and postsurgical follow-up care.

Administrative data would be used to measure progress at a provider level as well as a regional level.

8.2.2 Measuring the Gap

At a regional level, the LHINs should undertake an analysis to measure the gap between current practice and the recommendations outlined in this clinical handbook. The results of the gap analysis would serve to focus on specific areas requiring attention and help to prioritize implementation efforts. The gap analysis could also identify barriers to implementation as well as levers that can be used to foster the uptake of the clinical handbook recommendations.

8.2.3 Capacity Planning

The ministry and LHINs should work to determine appropriate provincial and regional capacities to address shoulder surgical volumes and needs at provincial and LHIN levels (i.e., access and quality targets). The ministry should collaborate with the LHINs to refine volume-planning methodology and LHIN-level allocations of funds; LHINs should work with the ministry to develop a transitional approach to funding that enables capacity building. Each LHIN will need to consider consolidating shoulder surgery to fewer hospitals in its region.

8.2.4 Service Capacity Planning

The ministry was interested in advice from the expert advisory panel around capacity planning and shifts across care settings for QBPs. The most important issue in this respect identified by the expert advisory panel is the inconsistent capacity in, and access to, funded postoperative rehabilitation across the province. This is a major opportunity area for the ministry, LHINs, hospitals, home care providers, and other providers

to work together to improve outcomes for postoperative patients and to impact rates of unplanned readmissions and complications.

Human resources shortages can challenge the implementation of community care for post-discharge populations in some regions of the province. In these regions, LHINs should be involved to grow capacity.

8.2.5 Implementation of Recommended Practices

Acknowledge provincial versus local care pathways—It should be recognized that the practices recommended in this clinical handbook have been defined at an aspirational level to guide all hospitals across the province. The clinical handbook is not intended to be an operational care pathway; individual providers will have to implement these best practices based on their own local circumstances and available capacities. In many cases, the implementation of these recommendations will be challenged by local arrangements or the availability of services. For example, admitted versus same-day surgery, and access to funded postoperative rehabilitation are not available in many communities.

Adapt recommended practices to the local level—Implementing recommended services will require customization at the local level. For example, follow-up care for a shoulder surgery patient after discharge may take place with a variety of primary care providers or a local surgeon, depending on the availability of services.

The recommended practices in this clinical handbook that are relevant to primary care providers, such as referral criteria for orthopaedic consultations, should be made available in electronic format for primary care providers.

8.3 Provider-Level Implementation

The implementation of best practices based on established guidelines may improve system efficiencies and reduce the regional disparities in clinical outcomes, benefiting patients and the health care system. The expert advisory panel strongly encourages hospitals with shoulder surgery programs to work with orthopaedic surgeons to undertake data quality improvement initiatives over the next 6 to 12 months.

Implement as a program of care—Many of these considerations speak to the need to approach the implementation of recommended practices not simply at the level of individual patients and clinicians, but within a program of care that requires organizational-level planning and resourcing, and the involvement of administrators. Program design should also involve a measurement system for tracking performance, thereby supporting quality improvement. The program should span the improvement of care for shoulder pain across care settings, including the community, recognizing that surgery and hospitalization are only parts of the continuum of care.

Track current practice against recommended practices—Many of the practices recommended by the expert advisory panel are not currently tracked in any consistent way at either the local or provincial level. Thus, it is difficult to know what gaps exist between current and ideal surgical practices and how much these gaps vary across different organizations and parts of the province. A key objective of developing a performance measurement strategy for shoulder surgery should be to enable organizations to track, audit, and evaluate the implementation of care pathways and recommended practices at the organizational level.

Through such monitoring, variances can be identified, progress monitored, and the pathway refined over time.

An implementation plan specific to the provider level might include these steps:

- Develop an organization-wide QBP steering committee to develop high-level generic plans for implementation
- Assess the readiness of the institution to provide a full breadth of care, and possible barriers to implementation
- Identify stakeholders and their required involvement (QBP specific)
- Roll out plans focused around the unique areas identified for changes
- Recruit dedicated individuals to provide support for education and implementation (QBP specific)
- Perform a gap assessment of the current standard of practice and the recommended best practice, recognizing the need for change
- Develop timelines for implementation
- Provide forums for discussion and education
- Establish ongoing monitoring, reporting, and evaluation of processes, quality indicators, and outcomes; hospitals should consider joining the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) as a quality improvement monitoring tool
- Develop a sustainability plan for maintaining the best practice standards
- Enter into discussions with other regional acute care hospitals to share lessons learned
- Respond to and incorporate new evidence and support new models of care
- Put shoulder postoperative protocols in place in all hospitals for shoulder surgery patients; where a hospital does not have postoperative protocols in place, the expert advisory panel members suggest that booklets such as those prepared by the Sunnybrook Health Sciences Centre (http://sunnybrook.ca/content/?page=musculoskeletal-education-healthcare-providers) would be helpful guides in developing the protocols
- Work with the LHINs to gain access to baseline data and participate in regional QBP implementation initiatives

The changes associated with the QBPs focus on identifying and implementing evidence-informed practice driven by clinical consensus. Clinicians will be tasked with identifying where their own expertise and protocols vary from such evidence-informed practices.

Collaboration with hospital administration will assist clinicians in identifying the challenges within the service, as well as the opportunities and feasibility for changes to their practices. Clinicians will continue to play an essential role in guiding hospitals to meet the needs of their patient population and ensuring that the highest-quality care is provided for all their patients.

Acute care hospitals should work with local community care access centres to develop education materials. Patient education materials should be standardized and available in multiple languages. Education materials for patients and caregivers at discharge should be used and reinforced by the home care team. Patients have expressed concerns that new educational materials distributed by home care service

providers are confusing or conflict with materials provided on discharge. When distributing educational materials, caregivers should be conscious of patients' and caregivers' health literacy.

For additional implementation details, providers should refer to *Toolkit to Support the Implementation of Quality-Based Procedures*, published by the Ontario Hospital Association. (27) The association suggests that there are three key success factors to QBP implementation: senior leadership support, clinician engagement, and high-quality data.

Link the quality of the patient experience—Provider organizations should consider engaging patients in this process. Patient participation in the evaluation and implementation of QBPs is one of the ways patients' values and perspectives are heard and integrated into health decisions.

Employ clinical champions—Leadership by clinical champions can foster the uptake of quality improvement change initiatives such as QBPs by engaging peers in ongoing discussions and shared experiences. A clinical champion should:

- Present and discuss the approach to QBP planning and implementation, help to set targets, create buy-in to new ideas through the sharing of personal experience, and track progress
- Advocate for ongoing QBP uptake and measurement as well as emphasizing the value of tracking data over time

9.0 Performance Evaluation and Feedback

9.1 Method of Selection of Indicators for Degenerative Disorders of the Shoulder

The expert advisory panel identified important measures across the episode of care and advised on potential indicators that could be used to measure the key processes and outcomes for the clinical pathway. Figure 6 describes, at a high level, the process of indicator identification, prioritization, and development.

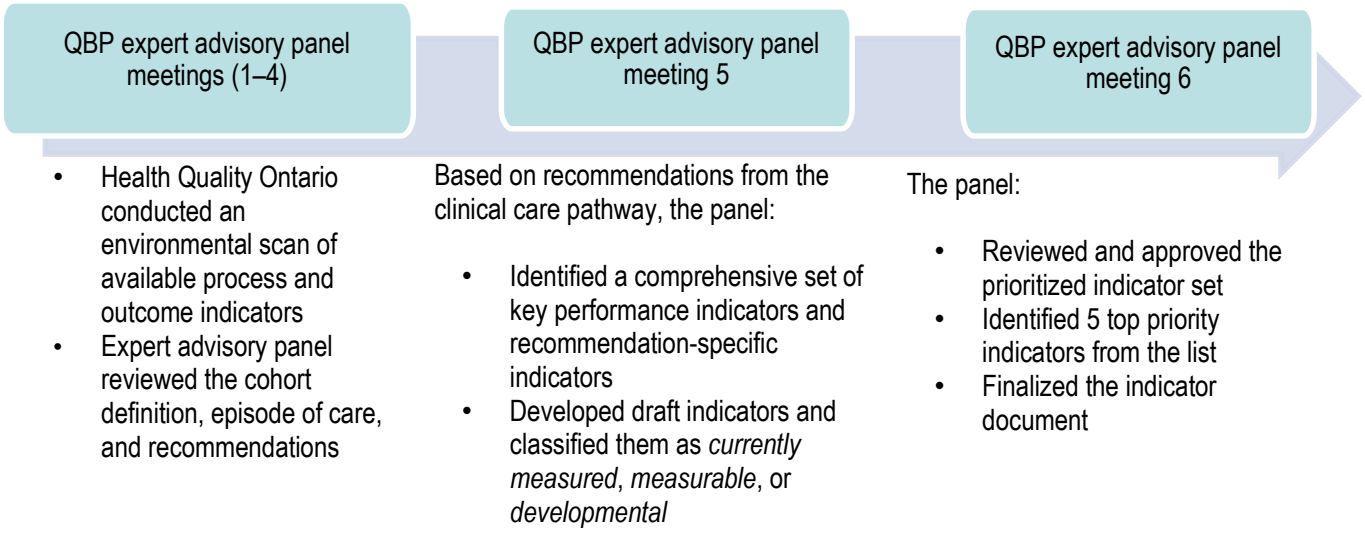

Figure 6: Methods for Development of the QBP Indicators
Abbreviation: QBP, Quality-Based Procedures.

Through the process, the expert advisory panel:

- Identified a limited set of key performance indicators for the comprehensive measurement of the episode of care across the indicator domains described by the Ministry of Health and Long-Term Care's integrated scorecard approach: effectiveness, appropriateness, integration, efficiency, access, and patient-centredness
- Identified a list of recommendation-specific indicators to measure adherence to specific recommendations that are critical to the episode of care
- Categorized these indicators as (a) *currently measured* in Ontario or similar health systems (the indicator is well defined and validated); (b) *measurable* with available provincial data (i.e., data are available to measure the indicator, but the indicator requires definition and validation); or (c) *developmental* (the indicator is not well defined, and data sources do not currently exist to measure it)

- Identified five indicators from the final indicator list as top priorities based on the importance and relevance of the indicator to the episode of care

9.2 Results

The selected indicators are categorized into two groups: key performance indicators (n = 8) and recommendation-specific indicators (n = 5).

Key performance indicators represent the most important outcomes and processes for the episodes of care for degenerative disorders of the shoulder. For the recommendation-specific indicators, the panel identified recommendations that were critical and for which adherence should be measured. Generally, recommendations associated with the selected outcome indicators were not chosen for further measurement; in these cases, the panel felt it would be more productive to measure the outcome. Only recommendations that were thought to be crucial processes or considered standards of care were selected for indicator development. This allowed for a comprehensive, yet parsimonious, suite of indicators for this QBP.

Tables 6 and 7 summarize the selected key performance indicators and recommendation-specific indicators. Details for each indicator can be found in Appendix 1. Five key performance indicators, but no recommendation-specific indicators, were identified as top priority indicators (Table 6).

Table 6: Selected Key Performance Indicators

Indicator	Indicator Type	Domain	Marked as Top Priority?	Status
Wait time 1: 90th percentile wait time for shoulder procedures (from referral date to surgeon consultation date)	Outcome	Access	No	Currently measured
Wait time 2: 90th percentile wait time for shoulder procedures (from decision to treat to surgical procedure date)	Outcome	Access	No	Currently measured
Percentage of procedures that were completed in in-patient settings (for rotator cuff and shoulder joint repair cases)	Process	Efficiency/ appropriately resourced	Yes	Measureable
Mean, median, and 90th percentile acute LOS (for shoulder arthroplasty cases)	Process	Efficiency/ appropriately resourced	Yes	Measureable
Percentage of patients who had an unplanned admission or ED visit within 30 days of shoulder surgery, for any cause	Outcome	Effectiveness	Yes	Measureable
Percentage of patients who had an unplanned admission or ED visit within 30 days of shoulder surgery, due to an adverse event related to surgery	Outcome	Effectiveness	Yes	Measureable
Percentage of patients who underwent reoperation on the same joint within 1 year of the index shoulder procedure	Outcome	Effectiveness	No	Measureable
Shoulder function status indicator	Outcome	Effectiveness	Yes	Developmental

Abbreviations: ED, emergency department; LOS, length of stay.

Table 7: Selected Recommendation-Specific Indicators

Indicator	Recommendation[a]	Indicator Type	Domain	Status
Percentage of procedures cancelled or postponed within 1 week prior to scheduled procedure date	*Module 4*: Pre-operative Assessment Pre-operative assessment clinic visits are necessary and should be conducted in an appropriate timeframe prior to the surgery date to avoid unnecessary cancellations and improve efficiency.	Process	Efficiency/access/ integration	Developmental
Percent compliance with completion of surgical safety checklist	*Module 6*: Surgery The WHO surgical safety checklist, (26) in addition to other surgical safety tools and supports, should be referenced prior to surgery.	Process	Effectiveness/ appropriateness	Measureable
Percentage of patients who received prophylactic antibiotics no earlier than 30 minutes prior to shoulder arthroplasty surgery	*Module 6*: Surgery Routine antibiotic administration is recommended no earlier than 30 minutes prior to the initiation of the surgery as prophylaxis against infection in patients receiving implanted materials.	Process	Effectiveness/ appropriateness	Developmental
Percentage of patients who received postoperative physiotherapy within 3 months after surgery	*Module 8*: Post-acute care A supervised outpatient postoperative physiotherapy program, supplemented by home exercise provided by the hospital at discharge, is recommended for patients who have undergone rotator cuff surgery or shoulder arthroplasty.	Process	Effectiveness/ appropriateness	Developmental
Percentage of patients who had a follow-up assessment within 6 weeks after surgery, by their treating surgeon	*Module 9*: Follow-up Patients should be assessed by the treating surgeon within 6 weeks of the surgical procedure.	Process	Effectiveness/ appropriateness	Measureable

Abbreviation: WHO, World Health Organization.

[a]Recommendations correspond to module recommendations within the section Recommended Practices for Degenerative Disorders of the Shoulder.

In introducing the QBPs the ministry has a strong interest in:

1. Supporting monitoring and evaluation of the impact (intended and unintended) of the introduction of QBPs
2. Providing benchmark information for clinicians and administrators that will enable mutual learning and promote on-going quality improvement
3. Providing performance-based information back to expert advisory panels to evaluate the impact of their work and update as required in real time

To guide the selection and development of relevant indicators for each QBP, the ministry, in consultation with experts in evaluation and performance measurement, developed an approach based on the policy objectives of the QBPs and a set of guiding principles. This resulted in the creation of an integrated scorecard with the following six quality domains:

- Effectiveness (including safety)
- Appropriateness
- Integration
- Efficiency
- Access
- Patient-centredness

The scorecard is based on the following guiding principles:

- ***Relevance***—the scorecard should accurately measure the response of the system to introducing QBPs
- ***Importance***—to facilitate improvement, the indicators should be meaningful for all potential stakeholders (patients, clinicians, administrators, LHINs, and the ministry)
- ***Alignment***—the scorecard should align with other indicator-related initiatives where appropriate
- ***Evidence***—the indicators in the integrated scorecard need to be scientifically sound or at least measure what is intended and accepted by the respective community (clinicians, administrators, and/or policy-decision makers)

A set of evaluation questions was identified for each of the QBP policy objectives outlining what the ministry would need to know in order to understand the intended and unintended impacts of the introduction of QBPs. These questions were translated into key provincial indicators resulting in a QBP scorecard (Table 8).

Table 8: QBP Scorecard

Quality Domain	What Is Being Measured?	Key Provincial Indicators
Effectiveness	What are the results of care received by patients and do the results vary across providers that cannot be explained by population characteristics as well as is care provided without harm?	1. Proportion of QBPs that improved outcomes 2. Proportion of QBPs that reduced variation in outcome 3. Proportion of (relevant) QBPs that reduced rates of adverse events and infections
Appropriateness	Is patient care being provided according to scientific knowledge and in a way that avoids overuse, underuse, or misuse?	4. Proportion of QBPs that reduced variation in utilization 5. Proportion of (relevant) QBPs that saw a substitution from in-patient to outpatient/day surgery 6. Proportion of (relevant) QBPs that saw a substitution to less invasive procedures 7. Increased rate of patients being involved in treatment decision 8. Proportion of (relevant) QBPs that saw an increase in discharge dispositions into the community
Integration	Are all parts of the health system organized, connected, and working with one another to provide high-quality care?	9. Reduction in 30-day readmissions rate (if relevant) 10. Improved access to appropriate primary and community care including, for example, psychosocial support (e.g., personal, family, financial, employment, and/or social needs) 11. Coordination of care (TBD) 12. Involvement of family (TBD)
Efficiency	Does the system make best use of available resources to yield maximum benefit ensuring that the system is sustainable for the long term?	13. Actual costs vs. QBP price
Access	Are those in need of care able to access services when needed?	14. Increase in wait times for QBPs/for specific populations for QBP 15. Increase in wait times for other procedures 16. Increase in distance patients have to travel to receive the appropriate care related to the QBP 17. Proportion of providers with a significant change in resource intensity weights (RIWs)
Patient-Centredness (*to be further developed*)	Is the patient/user at the centre of the care delivery and is there respect for and involvement of patients' values, preferences, and expressed needs in the care they receive? (TBC)	18. Increased rate of patients being involved in treatment decision 19. Coordination of care (TBD) 20. Involvement of family (TBD)

Abbreviations: QBP, Quality-Based Procedure; TBC, to be confirmed; TBD, to be determined.

It should be noted that although not explicitly mentioned as a separate domain, the equity component of quality of care is reflected across the six domains of the scorecard and will be assessed by stratifying

indicator results by key demographic variables and assessing comparability of findings across sub-groups. Where appropriate, the indicators will be risk-adjusted for important markers of patient complexity so that they will provide an accurate representation of the quality of care being provided to patients.

The ministry and experts recognized that to be meaningful for clinicians and administrators, it is important to tie indicators to clinical guidelines and care standards. Hence, advisory groups that developed the best practices were asked to translate the provincial-level indicators into QBP-specific indicators. In consulting the advisory groups for this purpose, the ministry was interested in identifying indicators both for which provincial data is readily available to calculate and for which new information would be required. Measures in the latter category are intended to guide future discussion with ministry partners regarding how identified data gaps might be addressed.

The indicators will enable the province and its partners to monitor and evaluate the quality of care and allow for benchmarking across organizations and clinicians. This will in turn support quality improvement and enable target setting for each QBP to ensure that the focus is on providing high quality care, as opposed to solely reducing costs.

It is important to note that process-related indicators selected by the expert panels will be most relevant at the provider level. For example, individual providers can review patient-level results in conjunction with supplementary demographic, financial, and other statistical information to help target care processes that might be re-engineered to help ensure that high-quality care is provided to patients.

The ministry recognizes that the evaluation process will be on-going and will require extensive collaboration with researchers, clinicians, administrators, and other relevant stakeholders to develop, measure, report, evaluate, and, if required, revise and/or include additional indicators to ensure that the information needs of its users are met.

10.0 Support for Change

The ministry, in collaboration with its partners, will deploy a number of field supports to support adoption of the funding policy. These supports include:

- **Committed clinical engagement** with representation from cross-sectoral health sector leadership and clinicians to champion change through the development of standards of care and the development of evidence-informed patient clinical pathways for the QBPs.
- **Dedicated multidisciplinary clinical expert groups** that seek clearly defined purposes, structures, processes, and tools which are fundamental for helping to navigate the course of change.
- **Strengthened relationships with ministry partners and supporting agencies** to seek input on the development and implementation of QBP policy, disseminate quality improvement tools, and support service capacity planning.
- **Alignment with quality levers such as the quality improvement plans (QIPs)**. QIPs strengthen the linkage between quality and funding and facilitate communication between the hospital board, administration, providers, and public on the hospital's plans for quality improvement and enhancement of patient-centred care.
- **Deployment of a Provincial Scale Applied Learning Strategy known as IDEAS** (Improving the Delivery of Excellence Across Sectors). IDEAS is Ontario's investment in field-driven capacity building for improvement. Its mission is to help build a high-performing health system by training a cadre of health system change agents that can support an approach to improvement of quality and value in Ontario.

We hope that these supports, including this clinical handbook, will help facilitate a sustainable dialogue between hospital administration, clinicians, and staff on the underlying evidence guiding QBP implementation. The field supports are intended to complement the quality improvement processes currently underway in your organization.

11.0 Expert Advisory Panel Membership

Health Quality Ontario's Expert Advisory Panel on Degenerative Disorders of the Shoulder

Name	Affiliation(s)	Appointment(s)
Chair		
Dr. James Waddell	St. Michael's Hospital University of Toronto, Division of Orthopaedic Surgery	Orthopaedic Surgeon Professor
Anaesthesiology		
Dr. Nick Lo	St. Michael's Hospital University of Toronto, Department of Anesthesia, Faculty of Medicine	Staff Anesthesiologist Assistant Professor
Dr. Kirit Patel	Rouge Valley Health System	Divisional Head, Anesthesiology
Executive Administration		
Leslie Gauthier	Hamilton Health Sciences	Director, Perioperative Services
Mei Lei Ling	Women's College Hospital	Clinical Manager, Surgical Services
Anne Marie MacLeod	Holland Musculoskeletal Program, Sunnybrook Health Sciences Centre	Operations Director
Rhona McGlasson	Bone and Joint Canada North Simcoe Muskoka Local Health Integration Network	Executive Director Surgical Coordinator
Tracey Reeves	Ottawa Hospital	Health Information Management Professional Coding Specialist, CHIM
Tiziana Silveri	North Bay Regional Health Centre	Vice-President of Clinical Services and Chief Nurse Executive
Physiotherapy and Rehabilitation		
Helen Razmjou	Sunnybrook Health Sciences Centre	Associate Scientist
Primary Care		
Dr. Christopher Jyu	Rouge Valley Health System	Family Physician

Name	Affiliation(s)	Appointment(s)
Orthopaedic Surgery		
Dr. Darren Drosdowech	Western University Roth McFarlane Hand and Upper Limb Centre, St. Joseph's Health Care	Associate Professor, Division of Orthopaedic Surgery
Dr. Stephen Gallay	Rouge Valley Health System	Division Head, Orthopaedics
Dr. Richard Holtby	Holland Musculoskeletal Research Program, Sunnybrook Health Sciences Centre University of Toronto, Faculty of Medicine	Affiliate Scientist Staff Surgeon Assistant Professor
Dr. Peter Lapner	The Ottawa Hospital University of Ottawa	Head, Upper Extremity Service, Division of Orthopedics Assistant Professor
Dr. Krishan Rajaratnam	McMaster University	Assistant Clinical Professor, Division of Orthopaedic Surgery

References

(1) Brouwers MC, Kho ME, Browman GP, Burgers JS, Cluzeau F, Feder G, et al. AGREE II: advancing guideline development, reporting and evaluation in health care. CMAJ. 2010;182(18):E839-42.

(2) Killian ML, Cavinatto L, Galatz LM, Thomopoulos S. Recent advances in shoulder research. Arthritis Res Ther. 2012;14(3):214.

(3) Millett PJ, Gobezie R, Boykin RE. Shoulder osteoarthritis: diagnosis and management. Am Fam Physician. 2008;78(5):605-11.

(4) Parsons IM, Weldon EJ, Titelman RM, Smith KL. Glenohumeral arthritis and its management. Phys Med Rehabil Clin N Am. 2004;15(2):447-74.

(5) Millett PJ, Horan MP, Pennock AT, Rios D. Comprehensive Arthroscopic Management (CAM) procedure: clinical results of a joint-preserving arthroscopic treatment for young, active patients with advanced shoulder osteoarthritis. Arthroscopy. 2013;29(3):440-8.

(6) Bhatia S, Hsu A, Lin EC, Chalmers P, Ellman M, Cole BJ, et al. Surgical treatment options for the young and active middle-aged patient with glenohumeral arthritis. Adv Orthop. 2012;2012:846843.

(7) MacDermid JC, Holtby R, Razmjou H, Bryant D. All-arthroscopic versus mini-open repair of small or moderate-sized rotator cuff tears: a protocol for a randomized trial. BMC Musculoskelet Disord. 2006;7:25.

(8) Brox JI, Staff PH, Ljunggren AE, Brevik JI. Arthroscopic surgery compared with supervised exercises in patients with rotator cuff disease (stage II impingement syndrome). BMJ. 1993;307(6909):899-903.

(9) Haahr JP, Ostergaard S, Dalsgaard J, Norup K, Frost P, Lausen S, et al. Exercises versus arthroscopic decompression in patients with subacromial impingement: a randomised, controlled study in 90 cases with a one year follow up. Ann Rheum Dis. 2005;64(5):760-4.

(10) Seida JC, Schouten JR, Mousavi SS, Tjosvold L, Vandermeer B, Milne A, et al. Comparative effectiveness of nonoperative and operative treatments for rotator cuff tears: comparative effectiveness review [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); 2010 [cited 2014 Nov 19]. Available from: www.effectivehealthcare.ahrq.gov/reports/final.cfm

(11) Rahme H, Solem-Bertoft E, Westerberg CE, Lundberg E, Sorensen S, Hilding S. The subacromial impingement syndrome. A study of results of treatment with special emphasis on predictive factors and pain-generating mechanisms. Scand J Rehabil Med. 1998;30(4):253-62.

(12) Toliopoulos P, Desmeules F, Boudreault J, Roy JS, Fremont P, MacDermid JC, et al. Efficacy of surgery for rotator cuff tendinopathy: a systematic review. Clin Rheumatol. 2014;33(10):1373-83.

(13) van der Meijden OA, Westgard P, Chandler Z, Gaskill TR, Kokmeyer D, Millett PJ. Rehabilitation after arthroscopic rotator cuff repair: current concepts review and evidence-based guidelines. Int J Sports Phys Ther. 2012;7(2):197-218.

(14) Carr AJ, Rees JL, Ramsay CR, Fitzpatrick R, Gray A, Moser J, et al. Protocol for the United Kingdom Rotator Cuff Study (UKUFF): a randomised controlled trial of open and arthroscopic rotator cuff repair. Bone Joint Res. 2014;3(5):155-60.

(15) Canadian Institute for Health Information. Canadian classification of health interventions [Internet]. Ottawa (ON): The Institute; 2012 [cited 2015]. Available from: http://www.cihi.ca/CIHI-ext-portal/pdf/internet/CCI_VOLUME_THREE_2012_EN

(16) Health Quality Ontario, Ministry of Health and Long-Term Care. Quality-based procedures: clinical handbook for primary hip and knee replacement [Internet]. Toronto (ON): Health Quality Ontario; 2013 [cited 2014 November 12]. Available from: http://www.health.gov.on.ca/en/pro/programs/ecfa/docs/qbp_prihipknee.pdf

(17) Health Quality Ontario, Ministry of Health and Long-Term Care. Quality-based procedures: clinical handbook for knee arthroscopy [Internet]. Toronto (ON): Health Quality Ontario; 2014 [cited 2014 November 12]. Available from: http://www.hqontario.ca/Portals/0/Documents/eds/clinical-handbooks/qbp-knee-arthroscopy-1408-en.pdf

(18) Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011;64(4):380-2.

(19) American Academy of Orthopaedic Surgeons. Treatment of glenohumeral joint osteoarthritis [Internet]. Rosemont (IL): American Academy of Orthopaedic Surgeons; 2009 [cited 2014 November 25]. Available from: http://www.aaos.org/Research/guidelines/gloguideline.pdf

(20) American Academy of Orthopaedic Surgeons. Optimizing the management of rotator cuff problems [Internet]. Rosemont (IL): American Academy of Orthopaedic Surgeons; 2010 [cited 2014 November 25]. Available from: http://www.aaos.org/Research/guidelines/RCP_guideline.pdf

(21) Shoulder disorders. In: Hegmann KT, editor. Occupational medicine practice guidelines: Evaluation and management of common health problems and functional recovery in workers. 3rd ed. Elk Grove Village (IL): American College of Occupational and Environmental Medicine; 2011. p. 1-297.

(22) Bussières AE, Peterson C, Taylor JA. Diagnostic imaging guideline for musculoskeletal complaints in adults-an evidence-based approach-part 2: upper extremity disorders. J Manipulative Physiol Ther. 2008;31(1):2-32.

(23) National Clinical Guideline Centre—Acute and Chronic Conditions. Venous thromboembolism: reducing the risk. Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital. [Internet]. London (UK): National Institute for Health and Clinical Excellence; 2010 [cited 2014 November 25]. Available from: http://www.nice.org.uk/guidance/cg92/evidence/cg92-venous-thromboembolism-reducing-the-risk-full-guideline3

(24) Hopman K, Krahe L, Lukersmith S, McColl AR, Vine K. Clinical practice guidelines for the management of rotator cuff syndrome in the workplace [Internet]. Sydney (AUS): University of New South Wales, Medicine, Rural Clinical School; 2013 [cited 2014 November 25]. Available from: http://rcs.med.unsw.edu.au/sites/default/files/rcs/page/RotatorCuffSyndromeGuidelines.pdf

(25) World Health Organization. WHO's cancer pain ladder for adults [Internet]. c2015 [cited 2015 January 5]. Available from: http://www.who.int/cancer/palliative/painladder/en/

(26) World Health Organization. WHO surgical safety checklist and implementation manual [Internet]. 2008 [cited 2014 November 26]. Available from: http://www.who.int/patientsafety/safesurgery/ss_checklist/en/

(27) Ontario Hospital Association. Toolkit to support the implementation of quality-based procedures [Internet]. Toronto (ON): Ontario Hospital Association; 2013 [cited 2015 February 15]. Available from: https://www.oha.com/KnowledgeCentre/Library/Toolkits/Documents/OHA_QBProcedures_toolkit_FNL.pdf

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

© Queen's Printer for Ontario, 2015

Ontario

Appendices

Appendix 1: Indicator Technical Specifications

Part 1. Key Performance Indicators

This section provides the technical specifications for each of the eight key performance indicators selected by the panel.

Table A1: Wait Time 1—90th Percentile Wait Time for Shoulder Procedures (from Referral Date to Surgeon Consultation Date)

GENERAL DESCRIPTION	Indicator description	This indicator measures the wait time (number of days) between referral date and consultation date for patients who received a shoulder procedure The 90th percentile wait time is the number of days (from referral date) within which 9 of 10 patients had their first consultation Performance indicator type: outcome Directionality: a lower 90th percentile wait time is better
	Indicator status	**Currently measured**
	Relevance	Scorecard dimension: access Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	Discussion regarding how to measure wait time 1 (i.e., based on specialty or diagnosis) is under way at provincial level. Target for wait time 1 should be varied for different conditions. Also, it should be noted that wait time 2 has impacts on wait time 1; usually, physicians who have long a wait time 2 are likely to have a long wait time 1 The panel agreed that it is necessary to collect the information to understand the current situation and monitor the trends on wait time 1 for this QBP. However, it is not appropriate to set up a relatively short targeted wait time 1 for shoulder QBP The panel also suggested two segments should be measured in the future for this QBP model: (1) wait time from referral from family physician to assessment centre, and (2) wait time from assessment centre to surgeon
DEFINTION & SOURCE INFORMATION	Calculation	Wait time calculation = “first consultation” date minus “referral” date less patient unavailable days, where the referral date is the date the referral is received in the clinician’s office 90th percentile calculation = number of days, ordered from shortest to longest, in which 90% of patients had their first consultation Inclusions: • Closed (or completed) wait list entries with actual procedure dates within date range • Patients who are 18 years or older on the day the procedure was completed • Procedures assigned as priority levels 2, 3, and 4 including missing priority Exclusions: • Procedures no longer required (all reasons) • Procedures assigned as priority level 1 • Wait list entries identified by hospitals as data-entry errors • Wait list entries without consultation and referral dates (no referral/follow-up cases)

		Notes: • If the patient unavailable dates fall outside the referral date up to first consultation date, the patient unavailable dates are not deducted from patient's wait days; these are considered data-entry errors • System-related delays, such as lack of hospital/clinical resources, are not subtracted from Wait 1 • Patient-related delays are deducted from Wait 1 days
	Data source/data elements	Wait Time Information System (WTIS)
	Risk adjustment, age/sex standardization	Report as crude number
GEOGRAPHY & TIMING	Timing and frequency of data release	Monthly wait time reports are sent to the ministry, LHINs, and hospitals every third Monday of the month. There are two reports: Wait 1 and Wait 2 by Service Area and Key procedures, and Wait 1 and Wait 2 summary by Service Area. The hospitals receive only the report on Wait 1 and Wait 2 summary by Service Area The data are not publicly available at current stage
	Levels of comparability	Province, LHIN, and hospital
	Trending	Data collection started in March 2012; the first reports were generated April 2013 for completed procedures
ADDITIONAL INFORMATION	Limitations	This indicator is only available for people who have undergone surgery (i.e., it does not measure the wait time for those patients who do not proceed to surgery)
	Comments	This indicator has been reported since April 2013 and may require further investigation to understand any further limitations
	Alignment	—

Abbreviations: LHIN, local health integration network; QBP, Quality-Based Procedure.

Table A2: Wait Time 2—90th Percentile Wait Time for Shoulder Procedures (From Decision to Treat to Surgical Procedure Date)

GENERAL DESCRIPTION	Indicator description	This indicator measures the wait time (number of days) between *decision to treat* date and surgical procedure date for patients who received a shoulder procedure The 90th percentile wait time is the number of days within which 9 or 10 patients had their shoulder procedures (from decision to treat date) Performance indicator type: outcome Directionality: a lower 90th percentile wait time is better
	Indicator status	**Currently measured**
	Relevance	Scorecard dimension: access Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	This is a key indicator in monitoring the progress of the Ontario Wait Time Strategy. As such, the indicator should also play an essential role in evaluating the impact of the shoulder degenerative disorders QBP The established provincial target is 182 days The panel suggested that further investigation on the wait time for the two cohorts (i.e., rotator cuff repair or shoulder arthroplasty) is required, given that access and wait time for those two procedures could be different. If necessary, this indicator should be reported separately for these two groups
DEFINTION & SOURCE INFORMATION	Calculation	Wait time calculation = "treatment" date minus "decision to treat" date less patient unavailable days 90th percentile calculation = number of days, ordered from shortest to longest, in which 90% of patients received their surgery Inclusions: • Shoulder procedures with procedure dates within the specified reporting period • Patients 18 years or older on the day the procedure was completed • Wait list entries assigned priority levels 2, 3, and 4 (i.e., elective cases) Exclusions: • Procedures no longer required • Wait list entries identified by hospitals as data-entry errors • Cases with very long waits (if confirmed by hospitals) • Priority 1 emergency cases Note: • If patient unavailable dates fall outside the decision to treat date up to surgical procedure date, the patient unavailable dates are not deducted from patient's wait days; these are considered data-entry errors
	Data source/data elements	Wait Time Information System (WTIS)
	Risk adjustment, age/sex standardization	Reported as crude numbers

GEOGRAPHY & TIMING	Timing and frequency of data release	The overall wait time for all shoulder procedures is publicly reported online. Monthly data are also available on an ad hoc request basis
	Levels of comparability	Province, LHIN, and hospital
	Trending	—
ADDITIONAL INFORMATION	Limitations	—
	Comments	—
	Alignment	Shoulder surgery wait times are included in the following: • Ontario Wait Times website for Surgical and Diagnostic Imaging Wait Times (http://www.health.gov.on.ca/en/public/programs/waittimes/surgery/default.aspx)

Abbreviations: LHIN, local health integration network; QBP, Quality-Based Procedure.

Table A3: Percentage of Procedures That Were Completed in In-patient Settings (for Rotator Cuff and Shoulder Joint Repair Cases)

GENERAL DESCRIPTION	Indicator description	This indicator measures the percentage of rotator cuff and shoulder joint repair procedures that are completed on an in-patient basis Performance indicator type: process
	Indicator status	**Measureable**
	Relevance	Scorecard dimension: efficiency/appropriately resourced Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	There is a wide variation in Ontario on the utilization of day surgery or in-patient service for rotator cuff and shoulder joint repair procedures. There are a number of hospitals with higher proportions of procedures that are performed in in-patient settings. This variation may be an area of interest as the ratio of day surgery to in-patient procedures may have implications on cost Please refer to the section Degenerative Disorders of the Shoulder: Cohort and Case Mix Analysis for data relating to the case volumes of procedures completed in in-patient versus outpatient settings (see Table 1) The panel suggested that it should be expected that over 90% of rotator cuff and shoulder joint repair cases are completed in outpatient settings; 10% of rotator cuff and shoulder joint repair cases with complications would be expected to be completed on an in-patient basis
DEFINTION & SOURCE INFORMATION	Numerator	Numerator = [number of procedures that are completed on an in-patient basis in the same time period]
	Denominator	Denominator = [number of patients with rotator cuff and shoulder joint repair procedures in given period]
	Data source/data elements	Discharge Abstract Database (DAD) National Ambulatory Care Reporting System (NACRS)
	Risk adjustment, age/sex standardization	Reported as crude numbers
GEOGRAPHY & TIMING	Timing and frequency of data release	—
	Levels of comparability	Province, LHIN, and hospital
	Trending	—
ADDITIONAL INFORMATION	Limitations	—
	Comments	—
	Alignment	—

Abbreviation: LHIN, local health integration network.

Table A4: Mean, Median, and 90th Percentile Acute Length of Stay (for Shoulder Arthroplasty Cases)

GENERAL DESCRIPTION	Indicator description	This indicator measures the average LOS in acute care for patients undergoing shoulder arthroplasty Performance indicator type: process Directionality: generally, lower is better; however, this is only true if clinical outcomes are not affected by premature discharge (see Importance section, below, for more information)
	Indicator status	**Measureable**
	Relevance	Scorecard dimension: efficiency/appropriately resourced Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	This is an important indicator for administrators to track because excessive acute LOS could substantially increase hospital costs needlessly. To ensure that lowering acute LOS does not impact clinical care, this indicator must be measured alongside other outcome indicators (notably adverse event rates and functional status) The current average acute LOS for shoulder arthroplasty is 2.4 days (see Table 1), and there is a wide variation among Ontario hospitals
DEFINTION & SOURCE INFORMATION	Calculations	Average acute LOS = [sum of all acute LOSs over the specified period of time for valid patients] divided by [number of valid patients over specified period of time] Median acute LOS = [number of days, ordered from shortest to longest, in which 50% of patients were discharged] 90th percentile acute LOS = [number of days, ordered from shortest to longest, in which 90% of patients were discharged] Note: • Acute LOS is the time period from the date and time of admission to acute care to the date and time of acute care completion
	Data source/data elements	Discharge Abstract Database (DAD)
	Risk adjustment, age/sex standardization	Reported as crude numbers
GEOGRAPHY & TIMING	Timing and frequency of data release	—
	Levels of comparability	Province, LHIN, and hospital
	Trending	—
ADDITIONAL INFORMATION	Limitations	—
	Comments	This indicator looks at in-patient cases only. Procedures done in day surgery settings are not included
	Alignment	—

Abbreviations: LHIN, local health integration network; LOS, length of stay.

Table A5: Percentage of Patients Who Had an Unplanned Admission or ED Visit Within 30 Days of Shoulder Surgery, for Any Cause

GENERAL DESCRIPTION	Indicator description	This indicator measures the percentage of procedures with a readmission, an unplanned admission, or an unplanned ED visit within 30 days of the index procedure Performance indicator type: outcome Directionality: lower is better
	Indicator status	**Measureable**
	Relevance	Scorecard dimension: effectiveness Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	A readmission, an unplanned in-patient admission, or an ED visit after a procedure may suggest that a complication or other unexpected event occurred during or following the surgery Understanding the incidence of such events can inform the structure of the episode-of-care model and serve as a potential performance indicator for monitoring quality of care
DEFINTION & SOURCE INFORMATION	Numerator	Numerator = [number of readmissions, unplanned admissions, ***or*** unplanned ED visits within 30 days of the index procedure] **Readmission is defined as** • Cases requiring a readmission within 30 days after in-patient discharge **Unplanned admission after day surgery visit is defined as:** • Cases requiring an admission within 30 days after discharge from an outpatient setting • Cases performed in an outpatient setting and directly transferred into an in-patient setting **Unplanned ED visits are defined as:** • Cases with *unplanned* ED visits within 30 days of surgery Note: When calculating the overall rate, the following cases should be excluded to avoid duplicate counting: ED visits that result in admission (i.e., ED records with discharge disposition "admitted") because the records are already captured in the above readmission or unplanned admission
	Denominator	Denominator = [number of patients with shoulder surgeries (in-patients and outpatients)] **Calculation of overall rate** = [number of readmissions, unplanned admissions, ***or*** unplanned ED visits within 30 days of index procedure] divided by [number of total patients with shoulder surgeries (in-patients and outpatients)] The indicator can be stratified into the following three categories: • **30-day readmission =** [number of readmissions within 30 days] divided by [number of in-patient cases with a shoulder surgery] • **30-day unplanned admission for shoulder procedures completed in outpatients** = [number of unplanned admissions within 30 days] divided by [number of day surgery cases with a shoulder surgery] • **30-day unplanned ED visits for all shoulder procedures =** [number of unplanned emergency department visits within 30 days] divided by [number of shoulder surgeries, including both in-patients and outpatients] Note: ED visits that result in admission should be included if this category is reported separately

	Data source/data elements	Discharge Abstract Database (DAD) National Ambulatory Care Reporting System (NACRS)
	Risk adjustment, age/sex standardization	Reported as crude numbers. Risk adjustment may be explored, but it may not be appropriate due to small volumes, which would lead to wide confidence intervals
GEOGRAPHY & TIMING	Timing and frequency of data release	—
	Levels of comparability	Province, LHIN, and hospital
	Trending	—
ADDITIONAL INFORMATION	Limitations	The numerator is expected to be very small. This will have an impact on reporting at the LHIN and hospital levels. Further investigation would be necessary
	Comments	—
	Alignment	—

Abbreviations: ED, emergency department; LHIN, local health integration network.

Table A6: Percentage of Patients Who Had an Unplanned Admission or ED Visit Within 30 Days of Shoulder Surgery, Due to an Adverse Event Related to Surgery

GENERAL DESCRIPTION	Indicator description	This indicator measures the percentage of patients who had an adverse event within 30 days following shoulder surgery, that required an admission or an unplanned ED visit Performance indicator type: outcome Directionality: lower is better
	Indicator status	**Measureable**
	Relevance	Scorecard dimension: effectiveness Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	The panel noted that measuring the admissions or unplanned ED visits due to adverse events within 30 days after a shoulder surgery is important. It is a potential performance indicator for monitoring outcomes
DEFINTION & SOURCE INFORMATION	Numerator	Numerator = [number of admissions ***or*** unplanned ED visits within 30 days of index procedure with an adverse event] **Adverse events are defined as:** • Neurological event • Surgical site bleeding • Surgical site infection • Intraoperative fracture **Admissions are defined as:** • Cases requiring an in-patient admission within 30 days after shoulder procedure *Or* • Cases performed in an outpatient setting and directly transferred into an in-patient setting **Unplanned ED visits are defined as:** • Cases with *unplanned* ED visits within 30 days of a shoulder procedure **Calculation of admission rate** = [number of admissions with an adverse event within 30 days of the index procedure] divided by [number of patients with a shoulder surgery, including both in-patients and outpatients] **Calculation of unplanned ED visits** = [number of unplanned ED visits with an adverse event within 30 days of the index procedure] divided by [number of patients with a shoulder surgery, including both in-patients and outpatients]
	Denominator	Denominator = [number of patients with a shoulder surgery, including both in-patients and outpatients]
	Data source/data elements	Discharge Abstract Database (DAD) National Ambulatory Care Reporting System (NACRS)
	Risk adjustment, age/sex standardization	Reported as crude numbers. Risk adjustment may be explored, but it may not be appropriate due to small volumes, which would lead to wide confidence intervals

GEOGRAPHY & TIMING	Timing and frequency of data release	—
	Levels of comparability	Province, LHIN, and hospital
	Trending	—
ADDITIONAL INFORMATION	Limitations	• The numerator is expected to be small. This would have an impact on reporting at the hospital level. Further investigation would be necessary. Might consider reporting the adverse event case number instead • Patients who experienced those adverse events but were seen by primary care are not captured in this indicator
	Comments	—
	Alignment	—

Abbreviations: ED, emergency department; LHIN, local health integration network.

Table A7: Percentage of Patients Who Underwent Reoperation on the Same Joint Within 1 Year of the Index Shoulder Procedure

GENERAL DESCRIPTION	Indicator description	This indicator measures the percentage of patients who had a shoulder procedure within 1 year of the initial shoulder procedure (same side) Performance indicator type: outcome Directionality: lower is better
	Indicator status	**Measureable**
	Relevance	Scorecard dimension: effectiveness Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	Shoulder reoperations that occur within 1 year of an initial procedure are considered a quality indicator for infection or instability, related to the index procedure Realistic target for the shoulder reoperation rate was discussed. The panel suggested that separated targets should be set up for rotator cuff repairs and for shoulder arthroplasty. However, further discussion regarding the target values is required when Ontario data become available
DEFINTION & SOURCE INFORMATION	Numerator	Numerator = [number of cases that received a shoulder procedure within 1 year of shoulder procedure on the same side] Inclusions: • Only the first shoulder procedure within 1 year following the index shoulder procedure is included Exclusions: • Unplanned procedures
	Denominator	Denominator = [number of all eligible shoulder procedures] Denominator can be stratified by index procedure: • Rotator cuff and shoulder repair • Shoulder arthroplasty
	Data source/data elements	Discharge Abstract Database (DAD) National Ambulatory Care Reporting System (NACRS)
	Risk adjustment, age/sex standardization	Report as crude number only
GEOGRAPHY & TIMING	Timing and frequency of data release	—
	Levels of comparability	Province, LHIN, and hospital
	Trending	—
ADDITIONAL INFORMATION	Limitations	—
	Comments	—
	Alignment	—

Abbreviation: LHIN, local health integration network.

Table A8: Shoulder Function Status Indicator

GENERAL DESCRIPTION	Indicator description	A shoulder function status indicator measures the functional status of patients who undergo shoulder procedures. Ideally, functional status should be measured prior to and after surgery so that changes in functional status can be calculated Performance indicator type: outcome Directionality: cannot be decided at current stage
	Indicator status	**Developmental**
	Relevance	Scorecard dimension: effectiveness Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	The panel strongly recommended this as an important area to measure to monitor the impact of shoulder procedures as the goal of the procedure is to improve function and control pain. A specific outcome indicator needs to be developed once the data are collected However, as with the hip fracture and primary hip and knee replacement QBPs, there is no systematic standardized approach for assessing and collecting functional data for shoulder procedures The panel provided the following considerations when selecting assessment tools: • It is important for hospitals that are already assessing and collecting functional status data using a validated assessment tool be able to (and encouraged to) continue using the same tool (even if it is not the same as the common assessment tool[s] selected for measurement of this indicator). If possible, the selected tools should be ones that are already commonly used across Ontario or are shown to be feasible for widespread use in Ontario. (Taken from *Quality-Based Procedures: Clinical Handbook for Primary Hip and Knee Replacement* (16)) • It is important to ensure that any selected assessment tool be aligned with other provincial initiatives and strategies

Abbreviations: LHIN, local health integration network; QBP, Quality-Based Procedure.

Part 2. Recommendation-Specific Indicators

The technical specifications of the five recommendation-specific indicators are provided below. These indicators were selected to measure the adherence to specific recommendations within the section Recommended Practices for Degenerative Disorders of the Shoulder.

Table A9: Percentage of Procedures Cancelled or Postponed Within 1 Week Prior to Scheduled Procedure Date

GENERAL INFORMATION	Indicator description	This indicator measures the proportion of procedures cancelled or postponed within 1 week prior to the scheduled procedure date Performance indicator type: process Directionality: lower is better
	Indicator status	**Developmental**
	Relevance	Scorecard dimension: efficiency/access/integration Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	This indicator is defined to measure the following recommendation: ***Module 4: Pre-operative Assessment*** *Pre-operative assessment clinic visits are necessary and should be conducted in an appropriate timeframe prior to the surgery date to avoid unnecessary cancellations and improve efficiency* As stated in the recommendation, pre-admission screenings completed within an appropriate timeframe can identify patients who cannot go on to surgery, and allow for other patients to be scheduled for surgery The panel considered that this is an important indicator as it shows the efficiency and system integration in terms of hospital scheduling This recommendation-specific indicator can be linked to the wait time 1 and 2 indicators. Adherence to this recommendation should have a positive impact on these two indicators
DEFINTION & SOURCE INFORMATION	Numerator	Proposed numerator = [number of valid cancellations where the cancellation date is ≤ 1 week prior to scheduled surgery over a specified period of time]
	Denominator	Proposed denominator = [number of all valid scheduled surgeries]
	Data source/data elements	**Proposed data sources for linkage:** • Wait Time Information System (WTIS) • Surgical Efficiency Targets Program (SETP)
	Risk adjustment, age/sex standardization	Reported as crude numbers
ADDITIONAL INFORMATION	Limitations	—
	Comments	Further study is required to understand the feasibility of this indicator
	Alignment	—

Abbreviation: LHIN, local health integration network.

Table A10: Percent Compliance With Completion of Surgical Safety Checklist

GENERAL INFORMATION	Indicator description	This indicator measures the proportion of patients with surgical safety checklists completed Performance indicator type: process Directionality: generally, higher is better
	Indicator status	**Measureable**
	Relevance	Scorecard dimension: effectiveness/appropriateness Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	This indicator is defined to measure the following recommendation: ***Module 6: Surgery*** *The WHO surgical safety checklist, (26) in addition to other surgical safety tools and supports, should be referenced prior to surgery* The surgical safety checklist compliance is currently measured and reported on Health Quality Ontario's website for all surgeries in the acute care setting. The aim of the checklist is to ensure that critical steps are being followed, which in turn leads to a reduction in avoidable risks associated with surgery
DEFINITION & SOURCE INFORMATION	Numerator	Numerator = [number of times all three phases of the surgical safety checklist were completed]
	Denominator	Denominator = [number of eligible shoulder procedures] Calculation of compliance (%) = numerator divided by denominator multiplied by 100
	Data source/data elements	• Surgical Efficiency Targets Program (SETP) *Or* • The ministry's Web-Enabled Reporting System (WERS) for those hospitals not participating in SETP
	Risk adjustment, age/sex standardization	Reported as crude numbers
ADDITIONAL INFORMATION	Limitations	—
	Comments	A *percentage surgical safety checklist compliance* is currently reported for all surgeries. However, SETP data fields for procedure codes and procedure description are not standardized It may be possible to link SETP with data from the Discharge Abstract Database or National Ambulatory Care Reporting System to ascertain shoulder procedures. More investigation is necessary to develop and validate a data-linkage methodology
	Alignment	—

Abbreviations: LHIN, local health integration network; WHO, World Health Organization.

Table A11: Percentage of Patients Who Received Prophylactic Antibiotics No Earlier Than 30 Minutes Prior to Shoulder Arthroplasty Surgery

GENERAL INFORMATION	Indicator description	This indicator measures the proportion of patients who receive prophylactic antibiotics in the right time period prior to their shoulder replacement surgery Performance indicator type: process Directionality: higher is better
	Indicator status	**Developmental**
	Relevance	Scorecard dimension: effectiveness/appropriateness Relevant for: province, LHINs, administrators, clinicians, patients
	Importance/ comments	This indicator is defined to measure the following recommendation : ***Module 6: Surgery*** *Routine antibiotic administration is recommended no earlier than 30 minutes prior to the initiation of the surgery as prophylaxis against infection in patients receiving implanted materials*
DEFINITION & SOURCE INFORMATION	Numerator	Numerator = [number of patients who received routine antibiotic treatment within 30 minutes prior to the initiation of the surgery]
	Denominator	Denominator = [number of eligible shoulder arthroplasty cases]
	Data source/data elements	Currently, there is no identified database that records this information in Ontario
	Risk adjustment, age/sex standardization	Reported as crude numbers
ADDITIONAL INFORMATION	Limitations	—
	Comments	This indicator is marked as developmental
	Alignment	—

Abbreviation: LHIN, local health integration network.

Table A12: Percentage of Patients Who Received Postoperative Physiotherapy Within 3 Months After Surgery

GENERAL INFORMATION	Indicator description	This indicator measures the proportion of patients who received postoperative physiotherapy within 3 months after a shoulder procedure Performance indicator type: process Directionality: generally, higher is better
	Indicator status	**Developmental**
	Relevance	Scorecard dimension: effectiveness/appropriateness Relevant for: province, LHINs, administrators, clinicians, patients
	Importance/	This indicator is defined to measure the following recommendation: ***Module 8: Post-acute Care*** *A supervised outpatient postoperative physiotherapy program, supplemented by home exercise provided by the hospital at discharge, is recommended for patients who have undergone rotator cuff surgery or shoulder arthroplasty* The panel identified two challenges when developing this indicator: 1. Defining the follow-up period—the panel agreed that 3 months is a reasonable follow-up period 2. Capturing the information—patients may use an OHIP-funded service or a private service; the panel suggested that this information could be collected when patients have their 3-month, 6-month, or final follow-up visit to the surgeon
DEFINITION & SOURCE INFORMATION	Numerator	Numerator = [number of patients who received postoperative physiotherapy within 3 months after surgery]
	Denominator	Denominator = [number of eligible shoulder procedures] Inclusion: • Rotator cuff repair surgery *Or* • Shoulder arthroplasty
	Data source/data elements	Currently, there is no identified database that records this information in Ontario
	Risk adjustment, age/sex standardization	Reported as crude numbers
ADDITIONAL INFORMATION	Limitations	—
	Comments	This indicator is marked as developmental
	Alignment	—

Abbreviations: LHIN, local health integration network; OHIP, Ontario Health Insurance Plan.

Table A13: Percentage of Patients Who Had a Follow-Up Assessment Within 6 Weeks After Surgery, by Their Treating Surgeon

GENERAL INFORMATION	Indicator description	This indicator measures the proportion of patients who undergo a shoulder procedure and have a follow-up assessment within 6 weeks by the treating surgeon Performance indicator type: process Directionality: generally, higher is better
	Indicator status	**Measureable**
	Relevance	Scorecard dimension: effectiveness/appropriateness Relevant for: province, LHINs, administrators, clinicians, patients
	Importance	This indicator is defined to measure the following recommendation: ***Module 9: Follow-Up*** *Patients should be assessed by the treating surgeon within 6 weeks of the surgical procedure*
DEFINITION & SOURCE INFORMATION	Numerator	Numerator = [number of patients who had a follow-up visit with their treating surgeons within 6 weeks of the shoulder procedure]
	Denominator	Denominator = [number of patients with eligible shoulder procedures]
	Data source/data elements	Potential data source to capture the numerator: Ontario Health Insurance Plan (OHIP) Denominator can be extracted from: • Discharge Abstract Database (DAD) • National Ambulatory Care Reporting System (NACRS)
	Risk adjustment, age/sex standardization	Reported as crude numbers
ADDITIONAL INFORMATION	Limitations	The follow-up visit is not condition or discharge specific. It captures a visit for any reason within 6 weeks to the surgeon who conducted the procedure
	Comments	—
	Alignment	—

Abbreviation: LHIN, local health integration network.

Appendix 2: Rapid Reviews

- *Antibiotic Prophylaxis in Shoulder Surgery*
- *Chlorhexidine-Alcohol Antisepsis as Prophylaxis for Postoperative Infections in Shoulder Surgery*
- *Acromioplasty Versus Conservative Therapy in Patients With Subacromial Impingement Syndrome Who Have Failed Conservative Therapy*
- *Open Versus Mini-open Versus Arthroscopic Rotator Cuff Repair Surgery in Patients With Rotator Cuff Tears*
- *Arthroscopic Debridement for Osteoarthritis of the Glenohumeral Joint*
- *Hemiarthroplasty Compared With Total Arthroplasty in Shoulder Osteoarthritis*
- *Open, Arthroscopic, and Mini-open Rotator Cuff Repair Surgery* (an economic rapid review)

A Rapid Review

JULY 2015

Ontario
Health Quality Ontario

Antibiotic Prophylaxis in Shoulder Surgery

HEALTH QUALITY ONTARIO

CONTEXT

Infection after shoulder surgery is rare but carries potentially serious risk of harm. The operative use of antibiotics has been suggested as a way to prevent surgical site infections.

RESEARCH QUESTION

What is the effectiveness and safety of parenteral or oral antibiotic prophylaxis for the prevention of surgical site infection compared with placebo or no antibiotic in patients undergoing shoulder surgery?

CONCLUSION

There is no evidence on which to base conclusions regarding the effectiveness or safety of antibiotic prophylaxis in shoulder surgery.

Context

Objective of Rapid Review

This analysis aimed to determine the effectiveness and safety of antibiotic therapy before shoulder surgery.

Clinical Need and Target Population

The incidence of infection has been estimated to range between 0.27% to 1.9% after rotator cuff repair and between 0% and 15.4% after shoulder arthroplasty. (1) Although infections after shoulder surgery are rare, they can cause serious harm. The most commonly isolated organisms from postoperative shoulder infections are *Staphylococcus aureus*, *S. epidermidis*, *Propionibacterium acnes*, and *Corynebacterium* species. (2) Infection due to *P. acnes* is reported more frequently after shoulder than after lower-extremity surgeries. (1) This could be because of the high concentration of sebaceous follicles in the head, neck, and thorax where the bacteria are found. *Propionibacterium acnes* is often isolated from even healthy skin in moist areas such as the axilla, which is close to sites commonly used as approaches for shoulder surgery. (1)

Technology/Technique

Antibiotic prophylaxis is the preoperative use of antibiotics to prevent surgical site infections. (3) It usually involves administration of a single dose of antibiotic, often given intravenously, close to the time of surgery. Specific guidance on the use of antibiotic prophylaxis for shoulder surgeries does not exist. However, general recommendations on the use of primary perioperative antibiotic prophylaxis to prevent surgical site infections after orthopedic surgery have been issued. (4) These guidelines recommend antibiotic prophylaxis only in patients undergoing orthopedic procedures involving implantation of internal fixation devices or total joint replacement.

Question, Methods, and Findings

Research Question

What is the effectiveness and safety of parenteral or oral antibiotic prophylaxis for the prevention of surgical site infection compared with placebo or no antibiotic in patients undergoing shoulder surgery?

Methods

Research questions are developed by Health Quality Ontario (HQO), in consultation with experts, end users, and/or applicants in the topic area. HQO produces 2 types of rapid reviews: a *Rapid Review of Systematic Reviews (RRSR)* is conducted when a relevant systematic review, health technology assessment, or meta-analysis is identified; when none of these types of summary reviews are available a *Rapid Review of Primary Studies (RRPS)* is conducted. If available, the results of the meta-analyses in the RRSR are reported for applicable outcomes. In an RRPS a narrative review of the literature is provided. The restrictions of the short time frame do not permit the authors to conduct their own meta-analyses in rapid reviews.

Literature Search Strategy

A literature search was performed on November 19, 2014, using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, Ovid Embase, and EBM Reviews, for studies published from January 1, 2004, to November 19, 2014 (Appendix 1). Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

Inclusion Criteria

- English-language full-text publications
- randomized controlled trials (RCTs), systematic reviews, meta-analyses, or observational studies
- adult patients who have undergone any type of shoulder surgery

Exclusion Criteria

- injury to the shoulder from an acute injury or trauma
- studies where outcomes of interest cannot be abstracted
- commentaries or case reports

Outcomes of Interest

- infection rates
- bacterial culture rates
- adverse events

Expert Panel

In August 2014, an Expert Advisory Panel on Episode of Care for Patients with Degenerative Disorders of the Shoulder was struck. Members of the panel included physicians, personnel from the Ministry of Health and Long-Term Care, health care administrators, and allied health professionals.

The role of the expert advisory panel was to provide advice on primary patient groupings; to review the evidence, guidance, and publications related to defined patient populations; to identify and prioritize interventions for review; and to advise on the development of a care pathway model. The role of Panel members was to provide advice on the scope of the project, the methods used, and the findings. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of the expert advisory panel members.

Assessment of the Quality of Evidence

The methodology for a RRPS includes a risk of bias assessment based on GRADE Working Group criteria (5) to assess quality of evidence. Risk of bias is evaluated based on consideration of allocation concealment, binding, accounting of patients and outcome events, selective reporting bias, and other limitations. The quality of the body of evidence for each outcome was examined according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group criteria. (5) The overall quality was determined to be high, moderate, low, or very low using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that randomized controlled trials (RCTs) are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. Limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors that may raise the quality of evidence were considered: the large magnitude of effect, the dose response gradient, and any residual confounding factors. (5) For more detailed information, please refer to the latest series of GRADE articles. (5)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of the effect

Findings

The database search yielded 1,461 citations published between January 1, 2004, and November 19, 2014 (with duplicates removed). Articles were excluded on the basis of information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment.

No studies met the inclusion criteria.

Conclusions

There is no evidence on which to base conclusions regarding the effectiveness or safety of antibiotic prophylaxis in shoulder surgery.

Acknowledgements

Editorial Staff
Elizabeth Jean Betsch, ELS

Medical Information Services
Caroline Higgins, BA, MISt
Corinne Holubowich, BEd, MLIS

Expert Advisory Panel on Degenerative Disorders of the Shoulder

Name	Affiliation(s)	Appointment(s)
Chair		
Dr. James Waddell	St. Michael's Hospital University of Toronto, Division of Orthopaedic Surgery	Orthopaedic Surgeon Professor
Anaesthesiology		
Dr. Nick Lo	St. Michael's Hospital University of Toronto, Department of Anesthesia, Faculty of Medicine	Staff Anesthesiologist Assistant Professor
Dr. Kirit Patel	Rouge Valley Health System	Divisional Head, Anesthesiology
Executive Administration		
Leslie Gauthier	Hamilton Health Sciences	Director, Perioperative Services
Mei Lei Ling	Women's College Hospital	Clinical Manager, Surgical Services
Anne Marie MacLeod	Holland Musculoskeletal Program, Sunnybrook Health Sciences Centre	Operations Director
Rhona McGlasson	Bone and Joint Canada North Simcoe Muskoka Local Health Integration Network	Executive Director Surgical Coordinator
Tracey Reeves	Ottawa Hospital	Health Information Management Professional Coding Specialist, CHIM
Tiziana Silveri	North Bay Regional Health Centre	Vice-President of Clinical Services and Chief Nurse Executive
Physiotherapy and Rehabilitation		
Helen Razmjou	Sunnybrook Health Sciences Centre	Associate Scientist
Primary Care		
Dr. Christopher Jyu	Rouge Valley Health System	Family Physician

Name	Affiliation(s)	Appointment(s)
Orthopaedic Surgery		
Dr. Darren Drosdowech	Western University Roth McFarlane Hand and Upper Limb Centre, St. Joseph's Health Care	Associate Professor, Division of Orthopaedic Surgery
Dr. Stephen Gallay	Rouge Valley Health System	Division Head, Orthopaedics
Dr. Richard Holtby	Holland Musculoskeletal Research Program, Sunnybrook Health Sciences Centre University of Toronto, Faculty of Medicine	Affiliate Scientist Staff Surgeon Assistant Professor
Dr. Peter Lapner	The Ottawa Hospital University of Ottawa	Head, Upper Extremity Service, Division of Orthopedics Assistant Professor
Dr. Krishan Rajaratnam	McMaster University	Assistant Clinical Professor, Division of Orthopaedic Surgery

Appendices

Appendix 1: Research Methods

Search Results

Search date: November 19, 2014
Databases searched: Ovid MEDLINE(R), EBM Databases (see below), Embase
Limits: 2009–current; English

Database: EBM Reviews - Cochrane Central Register of Controlled Trials <October 2014>, EBM Reviews - Cochrane Database of Systematic Reviews <2005 to October 2014>, EBM Reviews - Database of Abstracts of Reviews of Effects <4th Quarter 2014>, EBM Reviews - Health Technology Assessment <4th Quarter 2014>, Embase <1980 to 2014 Week 46>, All Ovid MEDLINE(R) <1946 to Present>

#	Searches	Results
1	Shoulder/ or Rotator Cuff/ or Glenoid Cavity/ or Acromion/	42037
2	Shoulder Joint/ use pmoz,cctr,coch,dare,clhta	15187
3	Shoulder Pain/ or Shoulder Impingement Syndrome/	15550
4	exp Tendon Injuries/ use pmoz,cctr,coch,dare,clhta	15497
5	exp Tendon Injury/ use emez	16279
6	((shoulder* adj3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff adj3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*).ti,ab.	40075
7	or/1-6	103955
8	exp Anti-Bacterial Agents/ use pmoz,cctr,coch,dare,clhta or Antibiotic Prophylaxis/ use pmoz,cctr,coch,dare,clhta or exp Macrolides/ use pmoz,cctr,coch,dare,clhta or exp Oxazolidinones/ use pmoz,cctr,coch,dare,clhta or Trimethoprim-Sulfamethoxazole Combination/ use pmoz,cctr,coch,dare,clhta	602495
9	exp Antibiotic Agent/ use emez or Antibiotic Prophylaxis/ use emez or exp Macrolide/ use emez or Oxazolidinone Derivative/ use emez or Cotrimoxazole/ use emez	966094
10	(anti?biotic* or anti?bacterial* or anti?microbial* or anti?infect* or cefazolin or cefepime or vancomycin or aztreonam or ciprofloxacin or levaquin or trimethoprim or cefepime).ti,ab.	817556
11	or/8-10	1911227
12	7 and 11	2413
13	limit 12 to english language [Limit not valid in CDSR,DARE; records were retained]	2160
14	limit 13 to yr="2004 -Current" [Limit not valid in DARE; records were retained]	1619
15	remove duplicates from 14	1461

References

(1) Millett PJ, Yen YM, Price CS, Horan MP, van der Meijden OA, Elser F. Propionibacterium acnes infection as an occult cause of postoperative shoulder pain: a case series. Clin Orthop Relat Res. 2011;469(10):2824-30.

(2) Saltzman MD, Marecek GS, Edwards SL, Kalainov DM. Infection after shoulder surgery. J Am Acad Orthop Surg. 2011;19(4):208-18.

(3) National Collaborating Centre for Women's and Children's Health. Surgical site infection: prevention and treatment of surgical site infection. London (UK): RCOG Press; 2008 [Cited: 2014 November 24]. 142 p. Available from: https://www.nice.org.uk/guidance/cg74.

(4) Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm. 2013;70(3):195-283.

(5) Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011;64(4):380-2.

Suggested Citation

TBA

About Health Quality Ontario

Health Quality Ontario is the provincial advisor on the quality of health care in Ontario, evaluating the effectiveness of health care technologies and services, providing evidence-based recommendations, reporting to the public on the quality of the health system, and supporting the spread of quality improvement throughout the system.

About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Permission Requests

All inquiries regarding permission to reproduce any content in Health Quality Ontario reports should be directed to EvidenceInfo@hqontario.ca.

How to Obtain Rapid Reviews From Health Quality Ontario

All rapid reviews are freely available in PDF format at the following URL: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/rapid-reviews.

Conflict of Interest Statement

There are no competing interests or conflicts of interest to declare.

Public Comment

Health Quality Ontario posts draft reports and recommendations on its website for public comment prior to publication. For more information, please visit: http://www.hqontario.ca/evidence/evidence-process/evidence-review-process/professional-and-public-engagement-and-consultation.

Disclaimer

This rapid review is the work of Health Quality Ontario and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. *T*he analysis may not have captured every relevant publication, and *relevant* scientific findings may have been reported since completion of the review. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. This report is current as of the date of the literature search specified in the Research Methods section. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

© Queen's Printer for Ontario, 2015

A Rapid Review

JULY 2015

Ontario
Health Quality Ontario

Chlorhexidine-Alcohol Antisepsis as Prophylaxis for Postoperative Infections in Shoulder Surgery

HEALTH QUALITY ONTARIO

CONTEXT

Deep infection after shoulder surgery is rare, but when it happens it can be severe. Chlorhexidine is known to be bactericidal, with considerable residual activity on the skin. Studies have demonstrated that alcohol has stronger immediate antibacterial effects, but weaker residual skin effects. Hence, a mixture of 2 compounds is suitable for prevention of postsurgical infections.

RESEARCH QUESTION

Is chlorhexidine-alcohol antisepsis more effective than other preoperative skin cleansers against postoperative infections and preoperative bacterial culture rates in patients undergoing shoulder surgery?

CONCLUSION

Chlorhexidine-alcohol antisepsis was more effective than other skin cleansers in reducing the overall bacterial culture rates in 2 randomized controlled trials, but these studies were underpowered to evaluate effectiveness against postoperative infections.

Chlorhexidine-Alcohol Antisepsis as Prophylaxis for Postoperative Infections in Shoulder Surgery: A Rapid Review. July 2015; pp. 1–14

Context

Objective of Rapid Review

This rapid review aims to evaluate whether chlorhexidine-alcohol antisepsis is more effective than other preoperative skin cleansers against postoperative infection rates and preoperative bacterial culture rates in patients undergoing shoulder surgery.

Clinical Need and Target Population

Description of Disease/Condition

Deep infection after shoulder surgery is rare, but when it happens it can be severe.

Global Prevalence of Shoulder Post-Surgical Infections

The prevalence of postsurgical infections has been reported to range from 0.27% to 1.9% for rotator cuff repair (1) and from 0% to 3.9% for unconstrained shoulder arthroplasty. (1)

Ontario's Prevalence of Shoulder Surgery

Of 142,000 orthopedic surgeries performed in Ontario in the period 2005–2006, 17% involved shoulders or elbows. (2)

Ontario Context

Because of its potential economic impact, the Expert Advisory Panel on Degenerative Issues of the Shoulder prioritized the use of chlorhexidine-alcohol solution before surgery (as compared with other skin-cleansing solutions) as a procedure that requires further review of scientific evidence on its clinical effectiveness.

Technology/Technique

Chlorhexidine is a chemical compound commonly used as a disinfectant against certain bacterial and fungal infections. At physiologic pH, it affects the bacteria by binding its positively charged ion with negatively charged bacterial cell walls. Depending on the concentration of chlorhexidine, binding can either inactivate or kill bacteria. (3) Chlorhexidine is usually given in an alcohol solution. Apart from acting as a solvent, alcohol has stronger immediate antibacterial effects, although its residual skin activity tends to be weaker than chlorhexidine. (4) Thus a combination of 2 compounds is best against postsurgical infections.

Regulatory Status

Chlorhexidine-alcohol antiseptic products have been approved for preoperative or preinjection skin preparation by Health Canada. (5)

Question, Methods, and Findings

Research Question

Is chlorhexidine-alcohol antisepsis more effective than other preoperative skin cleansers against postoperative infections and preoperative bacterial culture rates in patients undergoing shoulder surgery?

Methods

Research questions are developed by Health Quality Ontario, in consultation with experts, end users, and/or applicants in the topic area. EDS produces 2 types of rapid reviews: a *Rapid Review of Systematic Reviews (RRSR)* is conducted when a relevant systematic review, health technology assessment, or meta-analysis is identified; when none of these types of summary reviews are available a *Rapid Review of Primary Studies (RRPS)* is conducted. If available, the results of the meta-analyses in the RRSR are reported for applicable outcomes. In an RRPS a narrative review of the literature is provided. The restrictions of the short time frame do not permit the authors to conduct their own meta-analyses in rapid reviews.

Literature Search Strategy

A literature search was performed on November 18, 2014, using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, Ovid Embase, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), and EBM Reviews for studies published from January 1, 2004, to November 18, 2014. Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

Inclusion Criteria

- English-language full-text publications
- randomized controlled trials (RCTs), observational studies, systematic reviews, and meta-analyses
- any shoulder surgery

Exclusion Criterion

- surgeries not involving the shoulder

Outcomes of Interest

- postoperative (shoulder-related) infections
- bacterial colony

Expert Panel

In August 2014, an Expert Advisory Panel on Degenerative Issues of the Shoulder was struck. The role of the expert advisory panel was to develop recommended practices for shoulder QBPs in Ontario. The statements, conclusions, and views expressed in this report do not necessarily represent the views of the expert panel members.

Assessment of the Quality of Evidence

The methodology for an RRPS includes a risk of bias assessment based on GRADE Working Group criteria (6) to assess quality of evidence. Risk of bias is evaluated in consideration of allocation concealment, blinding, accounting of patients and outcome events, selective reporting bias, and other limitations (Table A2).

The quality of the body of evidence for each outcome was examined according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group criteria. (6) The overall quality was determined to be high, moderate, low, or very low using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that RCTs are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. Limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors that can raise the quality of evidence were considered: the large magnitude of effect, the dose-response gradient, and accounting for confounding. (6) For more detailed information, please refer to the latest series of GRADE articles. (6)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of the effect

Findings

The database search yielded 173 citations published between January 1, 2004, and November 18, 2014 (with duplicates removed). Articles were excluded on the basis of information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment.

Two studies (both RCTs) met the inclusion criteria. The reference lists of the included studies were hand-searched to identify other relevant studies, but no additional eligible studies were identified.

An RCT by Saltzman et al (1) found that ChloraPrep (2% chlorhexidine gluconate and 70% isopropyl alcohol) was more effective than DuraPrep (0.7% iodine paracrylex and 74% isopropyl alcohol) and povidone-iodine (0.75% iodine scrub and 1.0% iodine paint) at eliminating overall bacteria from the shoulder. The risk difference for the effectiveness of ChloraPrep versus DuraPrep was −12% (7% vs 19%;

P = 0.01), whereas the risk difference for the effectiveness of ChloraPrep versus povidone-iodine was −24% (7% vs 31%; *P* < 0.0001). Coagulase-negative *Staphylococcus* and *Propionibacterium acnes* were the most common isolates before skin preparation. The positive culture rate for coagulase-negative *Staphylococcus* in ChloraPrep was 2% versus 19% in the povidone-iodine group (*P* < 0.001) and 2% versus 4% in the DuraPrep group (*P* = 0.41). The positive culture rate for *P. acnes* was 7% versus 15% in the povidone-iodine group (*P* = 0.53) and 7% versus 12% in the DuraPrep group (*P* = 0.53). No postoperative infections developed in either group at a minimum follow-up of 10 months after surgery. The study included 84 men and 66 women with ages ranging from 17 to 79 years recruited in the period September 2007 through February 2008 in one clinic in United States.

An RCT by Murray et al (7) found that chlorhexidine-impregnated cloths (2% chlorhexidine gluconate and 70% isopropyl alcohol) were more effective than shower with soap and water in reducing the overall bacterial cultural rate (risk difference −28; 66% vs 94%; *P* = 0.0008). Coagulase-negative *Staphylococcus* and *P. acnes* were the most common isolates before skin preparation. The positive culture rate for *P. acnes* was 46% versus 58% in the control group (*P* = 0.32). The positive culture rate for coagulase-negative *Staphylococcus* was 30% versus 70% in the control group (*P* = 0.0001). No postsurgical infection occurred in either group. The study included 61 male and 39 female patients recruited in a single institution in the United States between January 2010 and May 2010.

Conclusions

- The 2 randomized controlled trials were not adequately powered to accurately examine the effectiveness of chlorhexidine-alcohol antisepsis on postsurgical shoulder infections.
- Given the low quality of evidence, chlorhexidine-alcohol antisepsis was deemed more effective than other skin preparation solutions in reducing the rate of bacterial culture.

Acknowledgements

Editorial Staff
Elizabeth Jean Betsch, ELS

Medical Information Services
Caroline Higgins, BA, MISt
Corinne Holubowich, BEd, MLIS

Expert Advisory Panel on Degenerative Disorders of the Shoulder

Name	Affiliation(s)	Appointment(s)
Chair		
Dr. James Waddell	St. Michael's Hospital University of Toronto, Division of Orthopaedic Surgery	Orthopaedic Surgeon Professor
Anaesthesiology		
Dr. Nick Lo	St. Michael's Hospital University of Toronto, Department of Anesthesia, Faculty of Medicine	Staff Anesthesiologist Assistant Professor
Dr. Kirit Patel	Rouge Valley Health System	Divisional Head, Anesthesiology
Executive Administration		
Leslie Gauthier	Hamilton Health Sciences	Director, Perioperative Services
Mei Lei Ling	Women's College Hospital	Clinical Manager, Surgical Services
Anne Marie MacLeod	Holland Musculoskeletal Program, Sunnybrook Health Sciences Centre	Operations Director
Rhona McGlasson	Bone and Joint Canada North Simcoe Muskoka Local Health Integration Network	Executive Director Surgical Coordinator
Tracey Reeves	Ottawa Hospital	Health Information Management Professional Coding Specialist, CHIM
Tiziana Silveri	North Bay Regional Health Centre	Vice-President of Clinical Services and Chief Nurse Executive
Physiotherapy and Rehabilitation		
Helen Razmjou	Sunnybrook Health Sciences Centre	Associate Scientist
Primary Care		
Dr. Christopher Jyu	Rouge Valley Health System	Family Physician

Name	Affiliation(s)	Appointment(s)
Orthopaedic Surgery		
Dr. Darren Drosdowech	Western University Roth McFarlane Hand and Upper Limb Centre, St. Joseph's Health Care	Associate Professor, Division of Orthopaedic Surgery
Dr. Stephen Gallay	Rouge Valley Health System	Division Head, Orthopaedics
Dr. Richard Holtby	Holland Musculoskeletal Research Program, Sunnybrook Health Sciences Centre University of Toronto, Faculty of Medicine	Affiliate Scientist Staff Surgeon Assistant Professor
Dr. Peter Lapner	The Ottawa Hospital University of Ottawa	Head, Upper Extremity Service, Division of Orthopedics Assistant Professor
Dr. Krishan Rajaratnam	McMaster University	Assistant Clinical Professor, Division of Orthopaedic Surgery

Appendices

Appendix 2: Research Methods

Search Results

Search date: November 18, 2014

Databases searched: Ovid MEDLINE(R), EBM Databases (see below), CINAHL

Database: EBM Reviews - Cochrane Central Register of Controlled Trials <October 2014>, EBM Reviews - Cochrane Database of Systematic Reviews <2005 to October 2014>, EBM Reviews - Database of Abstracts of Reviews of Effects <4th Quarter 2014>, EBM Reviews - Health Technology Assessment <4th Quarter 2014>, All Ovid MEDLINE(R) <1946 to Present>
Search Strategy:

---

1 Shoulder/ or Shoulder Joint/ or Rotator Cuff/ (27988)
2 Glenoid Cavity/ or Acromion/ (1034)
3 Shoulder Pain/ (3457)
4 Shoulder Impingement Syndrome/ (1437)
5 exp Tendon Injuries/ (15494)
6 ((shoulder* adj3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff adj3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*).ti,ab. (19612)
7 or/1-6 (50187)
8 exp Anti-Infective Agents, Local/ (191502)
9 Chlorhexidine/ (7718)
10 2-Propanol/ (1221)
11 Surgical Wound Infection/pc [Prevention & Control] (11391)
12 exp Antisepsis/ (4415)
13 Preoperative Care/ (56564)
14 Disinfection/ (10661)
15 (chlorhexidine or chlorhexidine-alcohol or tubulicid or sebidin or sebidin or novalsan or mk412a or mk-412a or mk 412a).mp. (11277)
16 (disinfect* or antiseptic* or anti septic* or antisepsis or aseps* or antibacterial* or anti bacterial* or antimicrobial* or anti microbial* or ((anti infect* or antiinfect*) adj2 agent*) or (skin adj3 (preparation or cleans*)) or bactericide* or bactericidal or microbicid*).ti,ab. (190578)
17 or/8-16 (441867)
18 7 and 17 (361)
19 limit 18 to (english language and yr="2004 -Current") [Limit not valid in CDSR,DARE; records were retained] (188)
20 remove duplicates from 19 (162)

CINAHL Search Strategy:

#	Query	Results
S1	(MH "Shoulder") OR (MH "Shoulder Joint+") OR (MH "Rotator Cuff+")	6,093
S2	(MH "Glenohumeral Joint") OR (MH "Acromion")	517
S3	(MH "Shoulder Pain")	1,923
S4	(MH "Shoulder Impingement Syndrome")	632
S5	(MH "Shoulder Injuries+")	3,824
S6	(MH "Tendon Injuries")	2,166
S7	((shoulder* N3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff N3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*)	9,549
S8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7	14,665
S9	(MH "Antiinfective Agents, Local")	2,817
S10	(MH "Chlorhexidine")	2,075
S11	(MH "Skin Preparation, Surgical")	439
S12	(MH "Propanols")	351
S13	(MH "Disinfectants")	0
S14	(MH "Surgical Wound Infection/PC")	2,542
S15	(MH "Asepsis")	1,267
S16	(MH "Sterilization and Disinfection")	7,143
S17	(chlorhexidine or chlorhexidine-alcohol or tubulicid or sebidin or sebidin or novalsan or mk412a or mk-412a or mk 412a or disinfect* or antiseptic* or anti septic* or antisepsis or aseps* or antibacterial* or anti bacterial* or antimicrobial* or anti microbial* or ((anti infect* or antiinfect*) N2 agent*) or (skin N3 (preparation or cleans*)) or bactericide* or bactericidal or microbicid*)	30,727
S18	S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17	32,707
S19	S8 AND S18	23
S20	S8 AND S18 Limiters - Published Date: 20040101-20141231; English Language	17

Appendix 2

Table A1: GRADE Evidence Profile for the Effectiveness of Chlorhexidine-Alcohol Solution on Postsurgical Infections and Presurgical Bacterial Culture Rates

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Postsurgical Infection							
2 (RCTs)	Serious limitation (−1)[a]	No serious limitation	No serious limitation	Serious limitations (−1)[c]	Undetected	None	⨁⨁ Low
	Serious limitation (−1)[a]			Serious limitations (−1)[c]	Undetected	None	⨁ ⨁ Low
Bacterial Colony							
2 (RCTs)	Serious limitation (−1)[b]	No serious limitations	No serious limitations	No serious limitation	Undetected	None	⨁⨁ Low
	Serious limitation (−1)[b]			No serious limitation	Undetected	None	⨁ ⨁ Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; RCTs, randomized controlled trials.
[a]Imbalance in baseline characteristics, and some patients did not adhere to protocol.
[b]No table with distribution of baseline characteristics is provided.
[c]Studies were not adequately powered for this outcome.

Table A2: Risk of Bias Among Randomized Controlled Trials Examining Effectiveness of Chlorhexidine-Alcohol Solution on Postsurgical Infections and Presurgical Bacterial Culture Rates

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Saltzman et al, 2009 (1)	No limitations	No limitations	No limitations	No limitations	Limitations[a]
Murray et al, 2011 (7)	No limitations	No limitations	Limitations[b]	No limitations	Limitations[c]

[a]Table showing patients' distribution characteristics is not provided, study not adequately powered.
[b]10% of subjects in the chlorhexidine group did not comply with the protocol.
[c]Imbalance in patients' baseline characteristics, study not adequately powered

References

(1) Saltzman MD, Nuber GW, Gryzlo SM, Marecek GS, Koh JL. Efficacy of surgical preparation solutions in shoulder surgery. J Bone Joint Surg Am. 2009;91(8):1949-53.

(2) Canizares M, Badley E, Davis A, MacKay C, Mahomed N. Orthopaedic surgery in Ontario in the era of the wait time strategy [Internet]. Toronto (ON): Institute for Clinical Evaluative Sciences; 2007 [cited 2014 Nov 24]. Available from: http://www.acreu.ca/pdf/pub5/07-02.pdf.

(3) Leikin JB, Paloucek FP. Chlorhexidine gluconate. In: Leikin JB, Paloucek FP, editors. Poisoning and toxicology handbook. 4th ed. Danvers (MA): CRC Press; 2007. p. 183.

(4) Maiwald M, Chan E. Pitfalls in evidence assessment: the case of chlorhexidine and alcohol in skin antisepsis. J Antimicrob Chemother. 2014;69(8):2017-21.

(5) Health Canada. Summary safety review—topical antiseptic products—risk of infection [Internet]. Ottawa (ON): Health Canada; 2014 [cited 2014 Nov 24]. Available from: http://www.hc-sc.gc.ca/dhp-mps/medeff/reviews-examens/antiseptic-antiseptique-eng.php.

(6) Guyatt GH, Oxman AD, Schünemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011 Apr; 64(4):380-2.

(7) Murray MR, Saltzman MD, Gryzlo SM, Terry MA, Woodward CC, Nuber GW. Efficacy of preoperative home use of 2% chlorhexidine gluconate cloth before shoulder surgery. J Shoulder Elbow Surg. 2011;20(6):928-33.

Suggested Citation

TBA

About Health Quality Ontario

Health Quality Ontario is the provincial advisor on the quality of health care in Ontario, evaluating the effectiveness of health care technologies and services, providing evidence-based recommendations, reporting to the public on the quality of the health system, and supporting the spread of quality improvement throughout the system.

About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Permission Requests

All inquiries regarding permission to reproduce any content in Health Quality Ontario reports should be directed to EvidenceInfo@hqontario.ca.

How to Obtain Rapid Reviews From Health Quality Ontario

All rapid reviews are freely available in PDF format at the following URL: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/rapid-reviews.

Conflict of Interest Statement

There are no competing interests or conflicts of interest to declare.

Public Comment

Health Quality Ontario posts draft reports and recommendations on its website for public comment prior to publication. For more information, please visit: http://www.hqontario.ca/evidence/evidence-process/evidence-review-process/professional-and-public-engagement-and-consultation.

Disclaimer

This rapid review is the work of Health Quality Ontario and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. The analysis may not have captured every relevant publication, and relevant scientific findings may have been reported since completion of the review. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. This report is current as of the date of the literature search specified in the Research Methods section. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

© Queen's Printer for Ontario, 2015

A Rapid Review

JULY 2015

Ontario
Health Quality Ontario

Acromioplasty Versus Conservative Therapy in Patients With Subacromial Impingement Syndrome Who Have Failed Conservative Therapy

HEALTH QUALITY ONTARIO

CONTEXT

Subacromial impingement syndrome (SIS) causes pain and loss of function, which lead to limitation of movement and ability to perform activities of daily living, and may result in absences from work. The aim of treatment is to control the pain and improve function. The first line of treatment is conservative (i.e., nonsurgical) therapy, comprising anti-inflammatory medications, physiotherapy, and corticosteroid injections. Surgery such as acromioplasty, also referred to as subacromial decompression, is indicated in cases where conservative therapy has failed.

RESEARCH QUESTION

What is the effectiveness of acromioplasty, compared with conservative therapy, on pain and functional scores in SIS patients for whom conservative therapy has failed?

CONCLUSION

Considering the low quality of the evidence and the lack of statistically significant differences in pain and function, it was deemed that there was insufficient evidence on which to determine if there is a benefit to acromioplasty over conservative therapy with regards to pain and function in SIS patients for whom conservative therapy has failed.

Context

Objective of Rapid Review

The objective is to compare the effectiveness of acromioplasty (also called subacromial decompression) with that of conservative therapy in patients with subacromial impingement syndrome (SIS) for whom conservative therapy has failed.

Clinical Need and Target Population

Description of Condition

SIS is an umbrella term for conditions such as rotator cuff syndrome, partial rotator cuff tears, and subacromial tendinitis. (1, 2) It is divided into 3 stages according to its progression: stage I—acute inflammation and tendinitis or bursitis; stage II—chronic inflammation with or without degeneration; and stage III—full rotator cuff tear. (3, 4)

SIS causes pain and loss of function, (5) which lead to limitation of movement and ability to perform activities of daily living, and may result in absences from work. (2) The aim of treatment is to control the pain and improve function. (3)

The first line of treatment is conservative (i.e., nonsurgical) therapy, comprising anti-inflammatory medications, physiotherapy, and corticosteroid injections. (2) Surgery such as acromioplasty is indicated in cases where conservative therapy has failed. (2)

Prevalence and Incidence

SIS is the most common shoulder condition. (2) The estimated point prevalence of shoulder conditions is 26% and lifetime prevalence 67%. (2)

Ontario Context

Acromioplasty is covered by the Ontario Ministry of Health and Long-Term Care. (6)

Technology/Technique

Acromioplasty is performed by removing the anterior edge and the undersurface of the anterior part of the acromion. (2) The procedure can be performed using either an open or arthroscopic surgical technique, with the latter avoiding a wide dissection. (2)

Question, Methods, and Findings

Research Question

What is the effectiveness of acromioplasty, compared with conservative therapy, on pain and functional scores in SIS patients for whom conservative therapy has failed?

Methods

Research questions are developed by Health Quality Ontario, in consultation with experts, end users, and/or applicants in the topic area. EDS produces 2 types of rapid reviews: a *Rapid Review of Systematic Reviews (RRSR)* is conducted when a relevant systematic review, health technology assessment, or meta-analysis is identified; when none of these types of summary reviews are available a *Rapid Review of Primary Studies (RRPS)* is conducted. If available, the results of the meta-analyses in the RRSR are reported for applicable outcomes. In an RRPS a narrative review of the literature is provided. The restrictions of the short time frame do not permit the authors to conduct their own meta-analyses in rapid reviews.

Literature Search Strategy

A literature search was performed on October 10, 2014, using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, and EBM Reviews, for studies published from January 1, 2008, to October 10, 2014. Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

Inclusion Criteria

- English-language full-text publications
- published between January 1, 2008, and October 10, 2014
- systematic reviews (SRs) and meta-analyses
- comparing acromioplasty with conservative therapy
- evaluating at least one of the outcomes of interest (pain and function)
- studies on adult patients with SIS

Exclusion Criteria

- including patients with full-thickness rotator cuff tears
- acromioplasty performed at same time as rotator-cuff repair

Intervention

- acromioplasty

Comparator

- conservative therapy (nonsurgical interventions that may include nonsteroidal anti-inflammatory drugs [NSAIDs], physiotherapy/exercise, and/or subacromial corticosteroid injections)

Outcomes of Interest

- pain
- function

Expert Panel

In August 2014, an Expert Advisory Panel on Episode of Care for Patients with Degenerative Disorders of the Shoulder was struck. Members of the panel included physicians, personnel from the Ministry of Health and Long-Term Care, health care administrators, and allied health professionals.

The role of the Expert Advisory Panel was to provide advice on primary patient groupings; to review the evidence, guidance, and publications related to defined patient populations; to identify and prioritize interventions for review; and to advise on the development of a care pathway model. The role of panel members was to provide advice on the scope of the project, the methods used, and the findings. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of the expert panel members.

Assessment of the Quality of Evidence

The Assessment of Multiple Systematic Reviews (AMSTAR) measurement tool was used to assess the methodological quality of systematic reviews. (7)

The quality of the body of evidence for each outcome was examined according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group criteria. (8) The overall quality was determined to be high, moderate, low, or very low using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that randomized controlled trials (RCTs) are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. Limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors that may raise the quality of evidence were considered: the large magnitude of effect, the dose response gradient, and any residual confounding factors. (8) For more detailed information, please refer to the latest series of GRADE articles. (8)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of the effect

Findings

The database search yielded 127 citations published between January 1, 2008, and October 10, 2014, (with duplicates removed). Articles were excluded based on information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment.

Three systematic reviews met the inclusion criteria. (1, 2, 9) The reference lists of the included studies and health technology assessment websites were hand-searched to identify other relevant studies; however, no additional study was identified. The characteristics of the systematic reviews identified are presented in Table 1.

Table 1: Summary of Systematic Reviews Comparing Acromioplasty With Conservative Therapy in SIS Patients

Author, Year	Literature Search End Date	Selection Criteria	Outcomes Evaluated	Number of Studies	AMSTAR Score[a]
Toliopoulos et al, 2014 (2)	August 2013	• RCTs • Adults with rotator cuff tendinopathy, shoulder impingement syndrome, subacromial bursitis, partial rotator cuff tears, bicipital tendinitis	• Pain • Function	• 4 RCTs	9
Gebremariam et al, 2011 (1)	February 2009	• Systematic reviews and RCTs • Patients with shoulder impingement syndrome • ≥ 2 weeks follow-up	• Pain • Function	• 3 RCTs	8
Coghlan et al, 2008 (9)	March 2006	• RCTs • Adults with rotator cuff disease	• Pain • Function	• 3 RCTs	10

Abbreviations: AMSTAR, Assessment of Multiple Systematic Reviews; RCT, randomized controlled trial; SIS, subacromial impingement syndrome.
[a]Maximum possible score is 11.

We selected the systematic review by Toliopoulos et al (2) to evaluate acromioplasty versus conservative therapy, given its high AMSTAR score and recent publication. It included the 3 RCTs identified in the previous systematic reviews and 1 additional RCT.

Of the 4 RCTs identified by Toliopoulos et al, (2) 3 compared arthroscopic acromioplasty, and 1 compared open acromioplasty, with conservative therapy. As shown in Table 2, the 3 studies on arthroscopic acromioplasty used different scales to evaluate pain and function.

Table 2: Outcome Scales Used in Included RCTs to Evaluate Effectiveness of Arthroscopic Acromioplasty in SIS Patients

Scale	Domains	Scoring
Pain		
Visual analogue scale (VAS) (10)	• Pain	• Ranges from 0 (no pain) to 10 (worst pain)
Function		
Neer Test (4)	• Pain • Function • Active range of motion • Anatomical or radiological evaluation	• Ranges from 10 (worst) to 100 (best)
Constant-Murley Shoulder Outcome Score (3)	• Pain • Activities of daily living • Active range of motion • Isometric shoulder strength	• Ranges from 0 points (worst) to 100 points (best)

Abbreviations: RCT, randomized controlled trial; SIS, subacromial impingement syndrome.

Arthroscopic Acromioplasty Versus Conservative Therapy

In the 3 RCTs that compared arthroscopic acromioplasty with conservative therapy, conservative therapy consisted of supervised exercise. (2) Table 3 provides details about study and patient characteristics.

Table 3: Study and Patient Characteristics—RCTs Comparing Arthroscopic Acromioplasty With Conservative Therapy in SIS Patients

Author, Year N (Surgery / Conservative Therapy) Follow-up	Outcomes Evaluated	Patient Population	Intervention	Comparator
Ketola et al, 2009 N = 140 (70 / 70) 2 years	• Pain	• Chronic shoulder impingement • Not relieved by conservative therapy	• Arthroscopic acromioplasty	• Supervised exercise
Haahr et al, 2005 N = 84 (41 / 43) 1 year	• Function	• Shoulder impingement syndrome • Symptoms lasting 6 months to 3 years	• Arthroscopic subacromial decompression	• Supervised exercise
Brox et al, 1993 N = 75 (45 / 30) 6 months	• Function	• Tendinopathy ≥ 3 months • Failed conservative therapy	• Arthroscopic subacromial decompression	• Supervised exercise

Abbreviations: N, number of patients; SIS, subacromial impingement syndrome.
Source: Toliopoulos et al. (2)

As shown in Table 4, no statistically significant difference was observed in either pain or function between the arthroscopic acromioplasty and conservative therapy groups.

Table 4: Study Results—RCTs Comparing Arthroscopic Acromioplasty With Conservative Therapy in SIS Patients

Author, Year N (Surgery / Conservative Therapy)	Pain	Function
Ketola et al, 2009 N = 140 (70 / 70)	VAS (0–10cm) at 2 years • Intervention: −3.9 cm • Conservative therapy: −3.7 cm Difference: 0.2 cm (99% CI, −1.61 to 1.14) *P* > 0.05	Not reported
Haahr et al, 2005 N = 84 (41 / 43)	Not reported	Constant-Murley Score at 6 months • Intervention: 15.5% increase • Conservative therapy: 20.1% increase *P* = 0.27 Constant-Murley Score at 12 months • Intervention: 19.9% increase • Conservative therapy: 21.3% increase *P* = 0.76
Brox et al, 1993 N = 75 (45 / 30)	Not reported	Difference in % change in Neer score at 6 months Intervention vs. conservative therapy • 2.0% (95% CI, -1.4 to 5.4)

Abbreviations: CI, confidence interval; cm, centimetre; N, number of patients; RCT, randomized controlled trial; SIS, subacromial impingement syndrome; VAS, visual analogue scale; vs., versus.
Source: Toliopoulos et al. (2)

All 3 RCTs had low risk of bias. However, the quality of the evidence was downgraded due to imprecision and indirectness as it was not clear whether the optimal information size had been reached to detect a difference between study groups, and it was impossible to determine whether patients in the conservative therapy groups were refractory to all forms of conservative therapy (see Appendix 2).

Open Acromioplasty Versus Conservative Therapy

One RCT compared open acromioplasty with an exercise regimen. See Table 5 for study and patient characteristics. (5)

Table 5: Study and Patient Characteristics—RCT Comparing Open Acromioplasty With Conservative Therapy in SIS Patients

Author, Year N (Surgery / Conservative Therapy) Follow-up	Outcomes Evaluated	Patient Population	Intervention	Comparator
Rahme et al, 1998 N = 42 (21 / 21) 12 months	• Pain	• Subacromial impingement syndrome with pain ≥ 12 months	• Open acromioplasty	• Exercise regimen

Abbreviations: N, number of patients; RCT, randomized controlled trial; SIS, subacromial impingement syndrome.
Source: Toliopoulos et al. (2)

No statistically significant difference in pain scores was observed between the open acromioplasty group and the conservative therapy group (see Table 6). Function was not evaluated.

Table 6: Study Results—RCT Comparing Open Acromioplasty With Conservative Therapy in SIS Patients

Author, Year N (Surgery / Conservative Therapy)	Pain
Rahme et al, 1998 N = 42 (21 / 21)	% of patients with > 50% pain reduction at 6 months (VAS) • Intervention: 57% • Conservative therapy: 33% *P* > 0.05 % of patients with > 50% pain reduction at 12 months (VAS) • Intervention: 76% • Conservative therapy: 67% *P* > 0.05

Abbreviations: N, number of patients; RCT, randomized controlled trial; SIS, subacromial impingement syndrome; VAS, visual analogue scale.
Source: Toliopoulos et al. (2)

The quality of the evidence was considered low; it was downgraded for imprecision and indirectness as it was not clear whether the optimal information size had been reached to detect a difference between study groups, and it was impossible to determine whether patients in the conservative therapy groups were refractory to all forms of conservative therapy (see Appendix 2).

Conclusions

Considering the low quality of the evidence and the lack of statistically significant differences in pain and function, it was deemed that there was insufficient evidence on which to determine if there is a benefit to acromioplasty over conservative therapy with regards to pain and function in patients with subacromial impingement syndrome who have failed conservative therapy.

Acknowledgements

Editorial Staff
Sue MacLeod, BA

Medical Information Services
Caroline Higgins, BA, MISt
Corinne Holubowich, BEd, MLIS

Expert Advisory Panel on Degenerative Disorders of the Shoulder

Name	Affiliation(s)	Appointment(s)
Chair		
Dr. James Waddell	St. Michael's Hospital University of Toronto, Division of Orthopaedic Surgery	Orthopaedic Surgeon Professor
Anaesthesiology		
Dr. Nick Lo	St. Michael's Hospital University of Toronto, Department of Anesthesia, Faculty of Medicine	Staff Anesthesiologist Assistant Professor
Dr. Kirit Patel	Rouge Valley Health System	Divisional Head, Anesthesiology
Executive Administration		
Leslie Gauthier	Hamilton Health Sciences	Director, Perioperative Services
Mei Lei Ling	Women's College Hospital	Clinical Manager, Surgical Services
Anne Marie MacLeod	Holland Musculoskeletal Program, Sunnybrook Health Sciences Centre	Operations Director
Rhona McGlasson	Bone and Joint Canada North Simcoe Muskoka Local Health Integration Network	Executive Director Surgical Coordinator
Tracey Reeves	Ottawa Hospital	Health Information Management Professional Coding Specialist, CHIM
Tiziana Silveri	North Bay Regional Health Centre	Vice-President of Clinical Services and Chief Nurse Executive
Physiotherapy and Rehabilitation		
Helen Razmjou	Sunnybrook Health Sciences Centre	Associate Scientist
Primary Care		
Dr. Christopher Jyu	Rouge Valley Health System	Family Physician

Name	Affiliation(s)	Appointment(s)
Orthopaedic Surgery		
Dr. Darren Drosdowech	Western University Roth McFarlane Hand and Upper Limb Centre, St. Joseph's Health Care	Associate Professor, Division of Orthopaedic Surgery
Dr. Stephen Gallay	Rouge Valley Health System	Division Head, Orthopaedics
Dr. Richard Holtby	Holland Musculoskeletal Research Program, Sunnybrook Health Sciences Centre University of Toronto, Faculty of Medicine	Affiliate Scientist Staff Surgeon Assistant Professor
Dr. Peter Lapner	The Ottawa Hospital University of Ottawa	Head, Upper Extremity Service, Division of Orthopedics Assistant Professor
Dr. Krishan Rajaratnam	McMaster University	Assistant Clinical Professor, Division of Orthopaedic Surgery

Appendices

Appendix 3: Research Methods

Search Results

Search date: October 10, 2014
Databases searched: Ovid MEDLINE, Ovid MEDLINE In-Process All EBM Databases (see below)
Limits: 2008-current; English
Filters: Meta-analyses, systematic review and health technology assessments

Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to August 2014>, EBM Reviews - ACP Journal Club <1991 to September 2014>, EBM Reviews - Database of Abstracts of Reviews of Effects <3rd Quarter 2014>, EBM Reviews - Cochrane Central Register of Controlled Trials <September 2014>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <3rd Quarter 2014>, EBM Reviews - NHS Economic Evaluation Database <3rd Quarter 2014>, Ovid MEDLINE(R) <1946 to October Week 1 2014>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <October 09, 2014>

Search Strategy:

---

1 Shoulder/ or Shoulder Joint/ or Rotator Cuff/ (27648)
2 Glenoid Cavity/ or Acromion/ (1023)
3 Shoulder Pain/ (3418)
4 Shoulder Impingement Syndrome/ (1428)
5 exp Tendon Injuries/ (15232)
6 ((shoulder* adj3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff adj3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*).ti,ab. (19369)
7 or/1-6 (49461)
8 exp Arthroscopy/ (18232)
9 (acromioplast* or (subacromial adj3 decompress*) or arthroscop* or (open adj3 (acromioplast* or decompress*))).ti,ab. (22787)
10 or/8-9 (26568)
11 7 and 10 (5755)
12 Meta Analysis.pt. (54084)
13 Meta-Analysis/ or Meta-Analysis as Topic/ or exp Technology Assessment, Biomedical/ (77111)
14 (((systematic* or methodologic*) adj3 (review* or overview*)) or pooled analysis or published studies or published literature or hand search* or handsearch* or medline or pubmed or embase or cochrane or cinahl or data synthes* or data extraction* or HTA or HTAs or (technolog* adj (assessment* or overview* or appraisal*))).ti,ab. (195634)
15 (meta analy* or metaanaly* or health technolog* assess*).mp. (141092)
16 or/12-15 (279115)
17 11 and 16 (170)
18 limit 17 to (english language and yr="2008 -Current") [Limit not valid in CDSR,ACP Journal Club,DARE,CLCMR; records were retained] (136)
19 remove duplicates from 18 (130)

Appendix 2: Evidence Quality Assessment

Table A1: AMSTAR Scores of Systematic Reviews Meeting the Inclusion Criteria for This Rapid Review

Author, Year	AMSTAR Score[a]	(1) Provided Study Design	(2) Duplicate Study Selection	(3) Broad Literature Search	(4) Considered Status of Publication	(5) Listed Excluded Studies	(6) Provided Characteristics of Studies	(7) Assessed Scientific Quality	(8) Considered Quality in Report	(9) Methods to Combine Appropriate	(10) Assessed Publication Bias	(11) Stated Conflict of Interest
Toliopoulos et al, 2014 (2)	9	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓
Gebremariam et al, 2011 (1)	8	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✓
Coghlan et al, 2008 (9)	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓

[a]Maximum possible score is 11. Details of AMSTAR score are described in Shea et al. (7)

Table A2: GRADE Evidence Profile for Comparison of Arthroscopic Acromioplasty With Conservative Therapy

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Pain							
1 (RCT)	No serious limitations	Not applicable	Serious limitation (−1)[a]	Serious limitation (−1)[b]	Undetected	Not applicable	⊕⊕ Low
Function							
2 (RCTs)	No serious limitations	Not applicable	Serious limitation (−1)[a]	Serious limitation (−1)[b]	Undetected	Not applicable	⊕⊕ Low

Abbreviations: RCT, randomized controlled trial.

[a]Not possible to determine if the patients were refractory to all forms of conservative therapy.

[b]The estimates used to calculate the sample size differed from what was observed in the studies. Therefore it is not clear if the optimal information size to detect a difference between the study groups was reached.

Table A3: GRADE Evidence Profile for Comparison of Open Acromioplasty With Conservative Therapy

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Pain							
1 (RCT)	No serious limitations	Not applicable	Serious limitation (−1)[a]	Serious limitation (−1)[b]	Undetected	Not applicable	⊕⊕ Low

Abbreviations: RCT, randomized controlled trial.

[a]Not possible to determine if the patients were refractory to all forms of conservative therapy.

[b]The estimates used to calculate the sample size differed from what was observed in the study. Therefore it is not clear if the optimal information size to detect a difference between the study groups was reached.

Table A4: Risk of Bias in Randomized Controlled Trials Comparing Arthroscopic Acromioplasty With Conservative Therapy

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Ketola et al, 2009 (10)	No limitations	No limitations	No limitations	No limitations	No limitations
Haahr et al, 2005 (3)	No limitations	No serious limitations	No limitations	No limitations	No limitations
Brox et al, 1993 (4)	No limitations	No limitations	No limitations	No limitations	No limitations

Table A5: Risk of Bias in Randomized Controlled Trial Comparing Open Acromioplasty With Conservative Therapy

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Rahme et al, 1998 (5)	No limitations	No serious limitations	No limitations	No limitations	No limitations

References

(1) Gebremariam L, Hay EM, Koes BW, Huisstede BM. Effectiveness of surgical and postsurgical interventions for the subacromial impingement syndrome: a systematic review. Arch Phys Med Rehabil. 2011;92(11):1900-13.

(2) Toliopoulos P, Desmeules F, Boudreault J, Roy JS, Fremont P, MacDermid JC, et al. Efficacy of surgery for rotator cuff tendinopathy: a systematic review. Clin Rheumatol. 2014;33(10):1373-83.

(3) Haahr JP, Ostergaard S, Dalsgaard J, Norup K, Frost P, Lausen S, et al. Exercises versus arthroscopic decompression in patients with subacromial impingement: a randomised, controlled study in 90 cases with a one year follow up. Ann Rheum Dis. 2005;64(5):760-4.

(4) Brox JI, Staff PH, Ljunggren AE, Brevik JI. Arthroscopic surgery compared with supervised exercises in patients with rotator cuff disease (stage II impingement syndrome). BMJ (Clinical research ed). 1993;307(6909):899-903.

(5) Rahme H, Solem-Bertoft E, Westerberg CE, Lundberg E, Sorensen S, Hilding S. The subacromial impingement syndrome. A study of results of treatment with special emphasis on predictive factors and pain-generating mechanisms. Scand J Rehabil Med. 1998;30(4):253-62.

(6) Ontario Ministry of Health and Long-Term Care. Schedule of benefits for physician services under the health services act [Internet]. Ontario: Ontario Ministry of Health and Long-Term Care; 2014 May [Cited: 2014-12-09]. 50 p. Available from: http://www.health.gov.on.ca/english/providers/program/ohip/sob/physserv/n_muscul.pdf.

(7) Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol. 2007;7:10.

(8) Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011;64(4):380-2.

(9) Coghlan JA, Buchbinder R, Green S, Johnston RV, Bell SN. Surgery for rotator cuff disease. Cochrane Database Syst Rev. 2008(1):CD005619.

(10) Ketola S, Lehtinen J, Arnala I, Nissinen M, Westenius H, Sintonen H, et al. Does arthroscopic acromioplasty provide any additional value in the treatment of shoulder impingement syndrome? a two-year randomised controlled trial. J Bone Joint Surg Br. 2009;91(10):1326-34.

Suggested Citation

TBA

About Health Quality Ontario

Health Quality Ontario is the provincial advisor on the quality of health care in Ontario, evaluating the effectiveness of health care technologies and services, providing evidence-based recommendations, reporting to the public on the quality of the health system, and supporting the spread of quality improvement throughout the system.

About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Permission Requests

All inquiries regarding permission to reproduce any content in Health Quality Ontario reports should be directed to EvidenceInfo@hqontario.ca.

How to Obtain Rapid Reviews From Health Quality Ontario

All rapid reviews are freely available in PDF format at the following URL: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/rapid-reviews.

Conflict of Interest Statement

There are no competing interests or conflicts of interest to declare.

Public Comment

Health Quality Ontario posts draft reports and recommendations on its website for public comment prior to publication. For more information, please visit: http://www.hqontario.ca/evidence/evidence-process/evidence-review-process/professional-and-public-engagement-and-consultation.

Disclaimer

This rapid review is the work of Health Quality Ontario and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. *T*he analysis may not have captured every relevant publication, and *relevant* scientific findings may have been reported since completion of the review. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. This report is current as of the date of the literature search specified in the Research Methods section. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

© Queen's Printer for Ontario, 2015

A Rapid Review

JULY 2015

Ontario
Health Quality Ontario

Open Versus Mini-open Versus Arthroscopic Rotator Cuff Repair Surgery in Patients With Rotator Cuff Tears

HEALTH QUALITY ONTARIO

CONTEXT

The rotator cuff consists of 4 muscle-tendon units. A rotator cuff tear is a discontinuation in 1 or more of these units and may lead to significant pain, weakness, and limitation of motion. Degeneration of the tendon is the main cause of tears, but they can also result from traumatic injury. Surgical approaches to rotator cuff repair include open, mini-open, and arthroscopic techniques.

RESEARCH QUESTION

What are the effects of open versus mini-open versus arthroscopic rotator cuff repair surgery on pain and functional scores, and on complication, retear, and reoperation rates, in patients with degenerative partial- or full-thickness rotator cuff tears?

CONCLUSION

There was insufficient evidence to determine whether there was any difference between the 3 types of repair surgery in patients with degenerative rotator cuff tears. The results of 2 ongoing randomized controlled trials may provide further evidence.

Open Versus Mini-open Versus Arthroscopic Rotator Cuff Repair Surgery in Patients With Rotator Cuff Tears: A Rapid Review. July 2015; pp. 1–25

Context

Objective of Rapid Review

To compare the effects of different approaches to rotator cuff repair surgery—open, mini-open, and arthroscopic—in patients with degenerative rotator cuff tears.

Clinical Need and Target Population

Description of Disease/Condition

The rotator cuff consists of 4 muscle-tendon units: supraspinatus, infraspinatus, subscapularis, and teres minor. (1) The rotator cuff muscles stabilize the glenohumeral joint during shoulder motion. (2)

A rotator cuff tear is a discontinuation in 1 or more of the muscle-tendon units. Degeneration of the tendon is the main cause of tears, but they can also result from traumatic injury. (3) Tears that involve only part of the tendon thickness and do not lead to retraction of the muscle-tendon unit are considered *partial-thickness tears*. (3) Tears associated with a full discontinuation of the rotator cuff fibres are considered *full-thickness tears* and are classified as small (< 1 cm), medium (1–3 cm), large (3–5 cm), and massive (> 5 cm). (3) Tears that involve 2 or more tendons may also be classified as massive. (3)
Rotator cuff tears may lead to significant pain, weakness, and limitation of motion. (3)

Prevalence and Incidence

The incidence of full-thickness rotator cuff tears increases with age; some studies report 5% incidence in people in their forties and 80% incidence in people in their eighties. (2)

Technology/Technique

The repair of a torn rotator cuff involves suturing the torn edges together and returning the tendon to the humeral head. (3) Surgical approaches include open, mini-open, and arthroscopic techniques. (4) In the open and mini-open approaches, the rotator cuff is repaired under direct vision through an incision in the skin; in the arthroscopic approach, the repair is performed via arthroscopic portals. (4) The mini-open approach reduces the size of the incision by combining open and arthroscopic techniques. (3)

Questions, Methods, and Findings

Research Questions

- What are the effects of arthroscopic versus mini-open rotator cuff repair surgery on pain and functional scores, and on complication, retear, and reoperation rates, in patients with degenerative partial- or full-thickness rotator cuff tears?
- What are the effects of open versus mini-open rotator cuff repair surgery on pain and functional scores, and on complication, retear, and reoperation rates, in patients with degenerative partial- or full-thickness rotator cuff tears?
- What are the effects of open versus arthroscopic rotator cuff repair surgery on pain and functional scores, and on complication, retear, and reoperation rates, in patients with degenerative partial- or full-thickness rotator cuff tears?

Methods

Research questions are developed by Health Quality Ontario, in consultation with experts, end users, and/or applicants in the topic area. EDS produces 2 types of rapid reviews: a *Rapid Review of Systematic Reviews (RRSR)* is conducted when a relevant systematic review, health technology assessment, or meta-analysis is identified; when none of these types of summary reviews are available, a *Rapid Review of Primary Studies (RRPS)* is conducted. If available, the results of the meta-analyses in the RRSR are reported for applicable outcomes. In an RRPS a narrative review of the literature is provided. The restrictions of the short time frame do not permit the authors to conduct their own meta-analyses in rapid reviews.

Literature Search Strategy

A literature search was performed on September 17, 2014, using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, and EBM Reviews, for studies published from January 1, 2009, to September 17, 2014. Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

See Appendix 1 for a detailed description of the search strategy, including terms and results.

Inclusion Criteria

- English-language full-text publications
- published between January 1, 2009, and September 17, 2014
- systematic reviews, meta-analyses, and health technology assessments
- comparing at least 2 of the 3 approaches to rotator cuff repair surgery
- evaluating at least 1 of the outcomes of interest (see below)
- in adult patients with partial- or full-thickness tears

Exclusion Criteria

- publications evaluating the outcomes of revision rotator cuff repair
- in patients with massive rotator cuff tears

Outcomes of Interest

- pain
- function (different scales were used in the studies; see Table 1 for details)
- postoperative complication rates (includes infection and adhesive capsulitis)
- retear rates
- reoperation rates

Table 1: Functional Outcome Scales Used in the Studies Identified

Scale	Domains	Scoring
ASES (3)	• Pain • Activities of daily living (10 items) • Range of motion (active and passive) • Physical signs • Strength • Stability	• Score ranges from 0 points (worst) to 100 points (best)
UCLA (3)	• Pain • Function • Range of motion • Strength • Patient satisfaction	• Maximum score: 35 (best)
Constant-Murley (5)	• Pain • Activities of daily living (10 items) • Range of motion • Strength	• Score ranges from 0 points (worst) to 100 points (best)

Abbreviations: ASES, American Shoulder and Elbow Surgeons; UCLA, University of California Los Angeles.

Expert Panel

In August 2014, an Expert Advisory Panel on Episode of Care for Patients with Degenerative Disorders of the Shoulder was struck. Members of the panel included physicians, personnel from the Ministry of Health and Long-Term Care, health care administrators, and allied health professionals. The role of the expert advisory panel was to provide advice on primary patient groupings; to review the evidence, guidance, and publications related to defined patient populations; to identify and prioritize interventions for review; and to advise on the development of a care pathway model. The role of panel members was to provide advice on the scope of the project, the methods used, and the findings. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of the expert advisory panel members.

Assessment of the Quality of Evidence

The Assessment of Multiple Systematic Reviews (AMSTAR) measurement tool was used to assess the methodological quality of systematic reviews. (6)

The methodology for an RRPS includes a risk of bias assessment based on the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group criteria to assess quality of evidence. (7) Risk of bias is evaluated based on consideration of allocation concealment, binding, accounting of patients and outcome events, selective reporting bias, and other limitations. (7)

The quality of the body of evidence for each outcome was examined according to the GRADE Working Group criteria. (7) The overall quality was determined to be high, moderate, low, or very low using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that randomized controlled trials (RCTs) are high quality, whereas observational studies are low quality. (7) Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. (7) Limitations in these areas resulted in downgrading the quality of evidence. (7) Finally, 3 main factors that may raise the quality of evidence were considered: the large magnitude of effect, the dose response gradient, and any residual confounding factors. (7) For more detailed information, please refer to the latest series of GRADE articles.

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of the effect

Findings

The database search yielded 155 citations published between January 1, 2009, and September 17, 2014, (with duplicates removed). Articles were excluded based on information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment.

Four systematic reviews met the inclusion criteria. The reference lists of the included studies were hand-searched to identify other relevant studies. Two ongoing RCTs were identified, 1 comparing arthroscopic versus mini-open repair in patients with small or moderate-sized rotator cuff tears, (2) and 1 comparing arthroscopic with open/mini-open rotator cuff repair in patients with rotator cuff tears. (4) Study results for both were not expected before the end of 2014.

For each included study, the study design was identified and is summarized below in Table 2, a modified version of a hierarchy of study design by Goodman, 1996. (8)

Table 2: Body of Evidence Examined According to Study Design

Study Design	Number of Eligible Studies
RCTs	
Systematic review of RCTs	1
Large RCT	
Small RCT	
Observational Studies	
Systematic review of non-RCTs with contemporaneous controls	3
Non-RCT with non-contemporaneous controls	
Systematic review of non-RCTs with historical controls	
Non-RCT with historical controls	
Database, registry, or cross-sectional study	
Case series	
Retrospective review, modelling	
Studies presented at an international conference	
Expert opinion	
Total	**4**

Abbreviation: RCT, randomized-controlled trial.

The systematic reviews included studies that compared the different surgical approaches to rotator cuff repair: open, mini-open, and arthroscopy (Table 3).

We selected the systematic review by Shan et al to evaluate the comparison between arthroscopic and mini-open rotator cuff repair, because it was published recently (2014) and had a moderate AMSTAR score (Appendix 2). We selected the systematic review by Seida et al to evaluate the comparisons between open and mini-open rotator cuff repair and open and arthroscopic rotator cuff repair, because it was published within the last 5 years and had a high AMSTAR score (Appendix 2).

Table 3: Summary of Systematic Reviews Evaluating Open, Mini-open, and Arthroscopic Rotator Cuff Repair Surgery

Author, Year	Comparators	Search Dates	Selection Criteria	Outcomes Evaluated	Number of Studies	AMSTAR Score
Shan et al, 2014 (9)	• Arthroscopic vs. mini-open RCR	1969–2013	• RCTs and controlled observational studies • Small to large rotator cuff tears	• Pain score (VAS) • Function score • Retear rate • Adhesive capsulitis rate	• 3 RCTs • 1 prospective cohort • 8 retrospective cohorts	7/11
Seida et al, 2010 (3)	• Open vs. mini-open RCR • Arthroscopic vs. mini-open RCR • Open vs. arthroscopic RCR	1990–2009	• RCTs and observational studies • > 10 patients enrolled • ≥ 12 months of follow-up	• Pain score (VAS) • Function score • Retear rate	**Open vs. mini-open** • 1 RCT • 2 retrospective cohorts **Arthroscopic vs. mini-open** • 1 RCT • 2 prospective cohorts • 7 retrospective cohorts **Open vs. arthroscopic** • 1 prospective cohort • 2 retrospective cohorts	10/11
Lindley and Jones, 2010 (10)	• Arthroscopic vs. mini-open RCR	1950–2007	• RCTs and controlled observational studies • Level III or higher	• Pain score (VAS) • Retear rate	• 10 observational studies	6/11
Duquin et al, 2010 (11)	• Open + mini-open vs. arthroscopic RCR	1980–2009	• Comparative studies	• Retear rate	• Unclear	5/11

Abbreviations: AMSTAR, Assessment of Multiple Systematic Reviews; RCR, rotator cuff repair; RCT, randomized controlled trial; VAS, visual analogue scale.

Arthroscopic Versus Mini-open Rotator Cuff Repair

The systematic review by Shan et al (9) compared the outcomes of arthroscopic versus mini-open rotator cuff repair in patients with small to large rotator cuff tears. The review included both RCTs and observational studies, but we chose to focus on the results of the RCTs. Since 2 (12, 13) of 3 RCTs had a high risk of bias due to a lack of treatment allocation concealment, we considered only 1 study (5) to be an RCT; this study was the focus of our analysis.

There was no statistically significant difference between the 2 surgical groups in rates of retear and adhesive capsulitis, or in functional score. Patients in the arthroscopic group had a statistically significantly lower pain score at 6 weeks after surgery compared to the mini-open group, but there was no statistically significant difference in pain scores between the 2 groups at 12 months after surgery. Table 4 provides information on the design, patient characteristics, and results of this RCT. Reoperation rates were not evaluated in the study identified. The quality of the evidence was low (Appendix 2).

Table 4: Arthroscopic Versus Mini-open Rotator Cuff Repair

Author, Year N (Arthroscopic/ Mini-open) Study Design Follow-up	Males, n (%)	Mean Age, y	Type of Tear	Results			
				Pain Score[a] (SE)	Mean Function Score[b] (SE)	Adhesive Capsulitis Rate, n (%)	Retear Rate, n (%)
Van der Zwaal et al, 2013 (5) N = 95 (47/48) RCT 14 months	57 (60)	• A: 57.2 • MO: 57.8	• Full-thickness, degenerative • Small to medium	**6 weeks** • A: 4.2 (0.3) • MO: 5.1 (0.3) *P* = 0.03 **12 months** • A: 2.4 (0.2) • MO: 2.8 (0.3) *P* = 0.37	**12 months** • A: 87 (1.8) • MO: 84 (2.2) *P* = 0.25	• A: 5 (10.6) • MO: 6 (12.5) *P* = 0.76	• A: 8 (17) • MO: 6 (12.5) *P* = 0.74

A, arthroscopic; MO, mini-open; N, number of patients; RCT, randomized controlled trial; SE, standard error; VAS, visual analogue scale.

[a]VAS, 0–10.

[b]Constant-Murley Score, 0–100.

Open Versus Mini-open Rotator Cuff Repair

The systematic review by Seida et al (3) identified 1 RCT (14) and 2 retrospective cohort studies (15, 16) that compared open and mini-open rotator cuff repairs in patients with small to large full-thickness rotator cuff tears.

Based on the analysis presented by Seida et al, (3) there was no statistically significant difference in functional score change from baseline between the open and mini-open groups. As well, there was no statistically significant difference in retear rates between the 2 groups. Table 5 provides information on the design, patient characteristics, and results of the studies identified. Pain scores and reoperation rates were not evaluated in the studies identified. The quality of the evidence was low for functional outcomes and very low for retear rates (Appendix 2).

Table 5: Open Versus Mini-open Rotator Cuff Repair

Author, Year N (Open/Mini-open) Study Design Follow-up	Males, n (%)	Mean Age, y (Range)	Type of Tear	Results		
				Mean Change in Functional Score[a] (SD)	Change in Functional Score[a] SMD (95% CI)	Retear Rate, n (%)
Mohtadi et al, 2008 (14) N = 73 (37/36) RCT 2 years	• Open: 22 (60) • MO: 20 (55)	• Open: 56.2 (44–77) • MO: 57 (33–82)	• Full-thickness • Small, medium, large, and massive	**3 months** • Open: 13.6 (20.5) • MO: 18 (21.69) **6 months** • Open: 20.7 (21.1) • MO: 26.9 (19.3) **12 months** • Open: 37 (16.7) • MO: 32.3 (18.2) **24 months** • Open: 39.3 (16.4) • MO: 36.1 (13.2)	**3 months** –0.21 (–0.70 to 0.29) **6 months** –0.30 (–0.80 to 0.19) **12 months** 0.27 (–0.23 to 0.76) **24 months** 0.21 (–0.28 to 0.71)	NR
Hata et al, 2004 (16) N = 78 (43/35) Retrospective cohort 4 years (mean)	• Open: 25 (58) • MO: 21 (60)	• Open: 58.1 (31–78) • MO: 60.6 (39–71)	• Type of tear NR • Small, medium, and large	**2 years** • Open: 18.7 (1.4) • MO: 19.6 (1.4)	**2 years** –0.64 (–1.09 to –0.18)	**6 and 12 months (MRI)** • Open: 0 • MO: 0 *P* could not be calculated
Baker et al, 1995 (15) N = 36 (20/16) Retrospective cohort 3.3 years (mean)	• Open: 12 (60) • MO: 9 (56)	• Open: 62 (38–81) • MO: 59 (41–71)	• Full-thickness • Small, medium, and large	**Timeframe unspecified** • Open: 22.1 (1.4) • MO: 22.2 (1.4)	**Timeframe unspecified** –0.07 (–0.72 to 0.58)	**12 months (arthrography)** • Open: 10 (50) • MO: 9 (52.9) *P* = 1.0
Pooled (observational studies) (3)	NA	NA	NA	NA	**–0.40 (–0.95 to 0.15)** **I^2 = 49%**	NA

Abbreviations: CI, confidence interval; I^2, heterogeneity; MO, mini-open; MRI, magnetic resonance imaging; NA, not applicable; NR, not reported; RCT, randomized controlled trial; SD, standard deviation; SMD, standardized mean difference.
[a]Preoperative versus postoperative.

Open Versus Arthroscopic Rotator Cuff Repair

The systematic review by Seida et al (3) identified 1 prospective (17) and 2 retrospective cohort studies (18, 19) that compared open and arthroscopic rotator cuff repair. All 3 studies evaluated functional outcomes, but only Millar et al (18) evaluated pain scores and retear rates (Table 6).

There was no statistically significant difference in pain scores or retear rates between the groups at either 6 months or 2 years after surgery (Table 6). Based on the analysis presented by Seida et al, (3) there was no statistically significant difference in the change in functional scores from baseline between the open and arthroscopic groups (Table 6). Reoperation rates were not evaluated in the studies identified. The quality of the evidence was very low (Appendix 2).

Table 6: Open Versus Arthroscopic Rotator Cuff Repair

Author, Year N (Open/ Arthroscopic) Study Design Follow-up	Males, n (%)	Mean Age, y (Range)	Type of Tear	Pain Score, 0–4 (SE)		Mean Change From Baseline, Functional Score SMD (95% CI)	Retear Measured by Ultrasound, n (%)
				At Rest	At Night		
Millar et al, 2009 (18) N = 159[a] (49/53/57) Retrospective cohort 2 years	• Open: 21 (43) • A (knotted): 24 (45) • A (knotless): 28 (49)	• Open: 58 (28–87) • A (knotted): 64 (40–90) • A (knotless): 69 (34–86)	• Full-thickness • Small, medium, large, and massive	**6 months** • Open: 1.0 (0.1) • A (knotted): 1.0 (0.1) • A (knotless): 0.7 (0.1) *Not statistically significant* **2 years** • Open: 0.5 (0.1) • A (knotted): 0.6 (0.1) • A (knotless): 0.6 (0.1) *Not statistically significant*	**6 months** • Open: 1.4 (0.1) • A (knotted): 1.0 (0.1) • A (knotless): 0.8 (0.1) *Not statistically significant* **2 years** • Open: 0.9 (0.2) • A (knotted): 0.9 (0.1) • A (knotless): 0.9 (0.1) *Not statistically significant*	**2 years** • Open: 24.0 (7.0) • Arthroscopic: 32.0 (11.3) SMD: –0.78 (–1.13 to –0.43)	**6 months** • Open: 19/49 (38.8) • A (knotted): 13/53 (25) • A (knotless): 9/57 (15.8) *Not statistically significant* **2 years** • Open: 8/20 (40) • A (knotted): 10/29 (34) • A (knotless): 7/38 (18.4) *Not statistically significant*
Costouros et al, 2006 (19) N = 37 (19/18) Retrospective cohort 21.1 months (mean)	• Open: 14 (74) • A: 12 (67)	• Open: 57 (40–75) • A: 54 (34–65)	• Full-thickness • Tear size NR in the systematic review	NR	NR	**Time frame not specified** • Open: 18.0 (7.1) • Arthroscopic: 24.0 (7.1) SMD: –0.83 (–1.51 to –0.16)	NR
Ide et al, 2005 (17) N = 100 (50/50) Prospective cohort 4.1 years (mean)	• Open: 39 (78) • A: 41 (82)	• Open: 57.1 (24–72) • A: 57 (25–78)	• Full-thickness • Small, medium, large, and massive	NR	NR	**Time frame not specified** • Open: 16.1 (3.2) • Arthroscopic: 15.9 (2.0) SMD: 0.07 (–0.32 to 0.47)	NR
Pooled (3)	NA	NA	NA	NA	NA	**–0.49 (–1.12 to 0.13)** **I^2 = 83%**	**NA**

Abbreviations: A, arthroscopic; CI, confidence interval; I^2, heterogeneity; NA, not applicable; NR, not reported; SE, standard error; SMD, standardized mean difference.
[a]Based on the full cohort of 159 patients undergoing rotator cuff repair surgery.

Conclusions

There was insufficient evidence to determine whether there was any difference between the 3 types of repair surgery in patients with degenerative rotator cuff tears. The results of 2 ongoing RCTs may provide further evidence.

Acknowledgements

Editorial Staff
Jeanne McKane, CPE, ELS(D)

Medical Information Services
Caroline Higgins, BA, MISt
Corinne Holubowich, BEd, MLIS

Expert Advisory Panel on Degenerative Disorders of the Shoulder

Name	Affiliation(s)	Appointment(s)
Chair		
Dr. James Waddell	St. Michael's Hospital University of Toronto, Division of Orthopaedic Surgery	Orthopaedic Surgeon Professor
Anaesthesiology		
Dr. Nick Lo	St. Michael's Hospital University of Toronto, Department of Anesthesia, Faculty of Medicine	Staff Anesthesiologist Assistant Professor
Dr. Kirit Patel	Rouge Valley Health System	Divisional Head, Anesthesiology
Executive Administration		
Leslie Gauthier	Hamilton Health Sciences	Director, Perioperative Services
Mei Lei Ling	Women's College Hospital	Clinical Manager, Surgical Services
Anne Marie MacLeod	Holland Musculoskeletal Program, Sunnybrook Health Sciences Centre	Operations Director
Rhona McGlasson	Bone and Joint Canada North Simcoe Muskoka Local Health Integration Network	Executive Director Surgical Coordinator
Tracey Reeves	Ottawa Hospital	Health Information Management Professional Coding Specialist, CHIM
Tiziana Silveri	North Bay Regional Health Centre	Vice-President of Clinical Services and Chief Nurse Executive
Physiotherapy and Rehabilitation		
Helen Razmjou	Sunnybrook Health Sciences Centre	Associate Scientist
Primary Care		
Dr. Christopher Jyu	Rouge Valley Health System	Family Physician

Name	Affiliation(s)	Appointment(s)
Orthopaedic Surgery		
Dr. Darren Drosdowech	Western University Roth McFarlane Hand and Upper Limb Centre, St. Joseph's Health Care	Associate Professor, Division of Orthopaedic Surgery
Dr. Stephen Gallay	Rouge Valley Health System	Division Head, Orthopaedics
Dr. Richard Holtby	Holland Musculoskeletal Research Program, Sunnybrook Health Sciences Centre University of Toronto, Faculty of Medicine	Affiliate Scientist Staff Surgeon Assistant Professor
Dr. Peter Lapner	The Ottawa Hospital University of Ottawa	Head, Upper Extremity Service, Division of Orthopedics Assistant Professor
Dr. Krishan Rajaratnam	McMaster University	Assistant Clinical Professor, Division of Orthopaedic Surgery

Appendices

Appendix 4: Research Methods

Search Results

Search date: September 17, 2014

Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to August 2014>, EBM Reviews - ACP Journal Club <1991 to August 2014>, EBM Reviews - Database of Abstracts of Reviews of Effects <3rd Quarter 2014>, EBM Reviews - Cochrane Central Register of Controlled Trials <August 2014>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <3rd Quarter 2014>, EBM Reviews - NHS Economic Evaluation Database <3rd Quarter 2014>, Ovid MEDLINE(R) <1946 to September Week 1 2014>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <September 16, 2014>

Search Strategy:

#	Searches	Results
1	Shoulder/ or Shoulder Joint/ or Rotator Cuff/	27316
2	Glenoid Cavity/ or Acromion/	1002
3	Shoulder Pain/	3377
4	Shoulder Impingement Syndrome/	1415
5	exp Tendon Injuries/	15030
6	((shoulder* adj3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff adj3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*).ti,ab.	19180
7	or/1-6	48968
8	Arthroscopy/	18070
9	(arthroscop* or mini-open or miniopen or MO or AA or ((open or rotator cuff*) adj3 (repair* or surg*))).ti,ab.	154131
10	or/8-9	157753
11	7 and 10	6753
12	Meta Analysis.pt.	52182
13	Meta-Analysis/ or Meta-Analysis as Topic/ or exp Technology Assessment, Biomedical/	74639
14	(((systematic* or methodologic*) adj3 (review* or overview*)) or pooled analysis or published studies or published literature or hand search* or handsearch* or medline or pubmed or embase or cochrane or cinahl or data synthes* or data extraction* or HTA or HTAs or (technolog* adj (assessment* or overview* or appraisal*))).ti,ab.	191624
15	(meta analy* or metaanaly* or health technolog* assess*).mp.	138360
16	or/12-15	273805
17	11 and 16	207
18	limit 17 to (english language and yr="2009 -Current") [Limit not valid in CDSR,ACP Journal Club,DARE,CLCMR; records were retained]	165
19	remove duplicates from 18	158

Appendix 5: Evidence Quality Assessment

Table A1: AMSTAR Scores of Included Systematic Reviews

Author, Year	AMSTAR Score	(1) Provided Study Design	(2) Duplicate Study Selection	(3) Broad Literature Search	(4) Considered Status of Publication	(5) Listed Excluded Studies	(6) Provided Characteristics of Studies	(7) Assessed Scientific Quality	(8) Considered Quality in Report	(9) Methods to Combine Appropriate	(10) Assessed Publication Bias	(11) Stated Conflict of Interest
Shan et al, 2014 (9)	7	✓	✓	✓	✗	✗	✓	✓	✗	✓	✗	✓
Seida et al, 2010 (3)	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓
Lindley and Jones, 2010 (10)	6	✓	✗	✓	✗	✗	✓	✓	✓	✗	✗	✓
Duquin et al, 2010 (11)	5	✓	✗	✓	✗	✗	✓	✓	✗	✗	✗	✓

Abbreviations: AMSTAR, Assessment of Multiple Systematic Reviews.

[a]Maximum possible score is 11. Details of AMSTAR score are described in Shea et al (6)

Table A2: GRADE Evidence Profile for Comparison of Arthroscopic Versus Mini-open Rotator Cuff Repair

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Pain Score							
1 (RCT)	No serious limitations	Not applicable	No serious limitations	Very serious limitations[a] (–2)	Undetected	Not applicable	⊕⊕ Low
Function							
1 (RCT)	No serious limitations	Not applicable	No serious limitations	Very serious limitations[a] (–2)	Undetected	Not applicable	⊕⊕ Low
Complications							
1 (RCT)	No serious limitations	Not applicable	No serious limitations	Very serious limitations[a] (–2)	Undetected	Not applicable	⊕⊕ Low
Retear Rate							
1 (RCT)	No serious limitations	Not applicable	No serious limitations	Very serious limitations[a] (–2)	Undetected	Not applicable	⊕⊕ Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, Evaluation; RCT, randomized-controlled trial.

[a]The sample size was calculated based on a different outcome than the ones used in this analysis; based on our sample size calculation, the study had very low power to detect a difference in outcomes between the treatment groups.

Table A3: GRADE Evidence Profile for Comparison of Open Versus Mini-open Rotator Cuff Repair

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Function							
1 (RCT)	No serious limitations	Not applicable	No serious limitations	Very serious limitations[a] (–2)	Undetected	Not applicable	⨁⨁ Low
Retear Rate							
2 (observational)	Serious limitations (–1)[b]	No serious limitations	No serious limitations	Very serious limitations[a] (–2)	Undetected	Not applicable	⨁ Very Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, Evaluation; RCT, randomized controlled trial.

[a]The sample size calculation was not provided in the publication; based on our sample size calculation, the study had very low power to detect a difference in outcomes between the treatment groups.

[b]Limitations with either the use of non-contemporaneous controls or unclear treatment assignment process, and limited control for potential confounders.

Table A4: GRADE Evidence Profile for Comparison of Open Versus Arthroscopic Rotator Cuff Repair

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Pain Score							
1 (observational)	Serious limitations (–1)[a]	Not applicable	No serious limitations	Very serious limitations[b] (–2)	Undetected	Not applicable	⨁ Very Low
Function							
3 (observational)	Serious limitations (–1)[a]	Not applicable	No serious limitations	Very serious limitations[b] (–2)	Undetected	Not applicable	⨁ Very Low
Retear Rate							
1 (observational)	Serious limitations (–1)[a]	Not applicable	No serious limitations	Very serious limitations[b] (–2)	Undetected	Not applicable	⨁ Very Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, Evaluation.

[a]Limitations associated with eligibility criteria, control for confounding, and losses to follow-up identified.

[b]The sample size calculation was not provided in the publication; based on our sample size calculation, the study had very low power to detect a difference in outcomes between the treatment groups.

Table A5: Risk of Bias Among Randomized Controlled Trials for the Comparison of Arthroscopic Versus Mini-open Rotator Cuff Repair

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Zwaal et al, 2013 (5)	No limitations	No serious limitations[b]	No limitations	No limitations	No limitations
Cho et al, 2012 (12)	Serious limitations[a]	No serious limitations[b]	No limitations	No limitations	No limitations
Kasten et al, 2011 (13)	Serious limitations[a]	No serious limitations[b]	No limitations	No limitations	No limitations

[a]Investigators were aware of the group to which the next enrolled patient would be assigned.
[b]Although there was no blinding of patients and investigators to the study intervention to which patients were allocated, it was not considered a serious limitation.

Table A6: Risk of Bias Among Randomized Controlled Trials for the Comparison of Open Versus Mini-open Rotator Cuff Repair

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Mohtadi et al, 2008 (14)	No limitations	No limitations	No limitations	No limitations	No limitations

Table A7: Risk of Bias Among Observational Trials for the Comparison of Open Versus Mini-open Rotator Cuff Repair

Author, Year	Appropriate Eligibility Criteria	Appropriate Measurement of Exposure	Appropriate Measurement of Outcome	Adequate Control for Confounding	Complete Follow-Up
Hata et al, 2004 (16)	Serious limitations[a]	No limitations	Limitations[b]	Limitations[c]	No limitations
Baker et al, 1995 (15)	Serious limitations[d]	No limitations	Limitations[b]	Limitations[c]	No limitations

[a]Non-contemporaneous controls.
[b]Outcome assessment performed by unblinded investigators.
[c]Limited accounting for potential confounders.
[d]Unclear how the treatment allocation was performed.

Table A8: Risk of Bias Among Observational Trials for the Comparison of Open Versus Arthroscopic Rotator Cuff Repair

Author, Year	Appropriate Eligibility Criteria	Appropriate Measurement of Exposure	Appropriate Measurement of Outcome	Adequate Control for Confounding	Complete Follow-Up
Millar et al, 2009 (18)	Limitations[a]	No limitations	No limitations	Limitations[b]	Limitations[c]
Costouros et al, 2006 (3)[d]	No limitations	No limitations	Limitations[e]	No limitations	Limitations[e]
Ide et al, 2005 (17)	Serious limitations[f]	No limitations	No limitations	Limitations[b]	No limitations

[a]Use of non-contemporaneous controls.
[b]Limited accounting for potential confounders.
[c]Significant number of patients lost to follow-up.
[d]Study could not be retrieved; the risk of bias assessment was based on the assessment done by Seida et al. (3)
[e]Details on the limitations not provided.
[f]No details on how the intervention and control groups were assigned.

References

(1) Seida JC, LeBlanc C, Schouten JR, Mousavi SS, Hartling L, Vandermeer B, et al. Systematic review: nonoperative and operative treatments for rotator cuff tears. Ann Intern Med. 2010;153(4):246-55.

(2) MacDermid JC, Holtby R, Razmjou H, Bryant D. All-arthroscopic versus mini-open repair of small or moderate-sized rotator cuff tears: a protocol for a randomized trial. BMC Musculoskelet Disord. 2006;7:25.

(3) Seida JC, Schouten JR, Mousavi SS, Tjosvold L, Vandermeer B, Milne A, et al. Comparative effectiveness of nonoperative and operative treatments for rotator cuff tears: comparative effectiveness review. [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); 2010 July [cited 2014 Nov 19]. 177 p. Available from: www.effectivehealthcare.ahrq.gov/reports/final.cfm.

(4) Carr AJ, Rees JL, Ramsay CR, Fitzpatrick R, Gray A, Moser J, et al. Protocol for the United Kingdom Rotator Cuff Study (UKUFF): a randomised controlled trial of open and arthroscopic rotator cuff repair. Bone Joint Res. 2014;3(5):155-60.

(5) van der Zwaal P, Thomassen BJ, Nieuwenhuijse MJ, Lindenburg R, Swen JW, van Arkel ER. Clinical outcome in all-arthroscopic versus mini-open rotator cuff repair in small to medium-sized tears: a randomized controlled trial in 100 patients with 1-year follow-up. Arthroscopy. 2013;29(2):266-73.

(6) Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol. 2007;7:10.

(7) Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011;64(4):380-2.

(8) Goodman C. Literature searching and evidence interpretation for assessing health care practices. Stockholm, Sweden: Swedish Council on Technology Assessment in Health Care; 1996. 81 p. SBU Report No. 119E.

(9) Shan L, Fu D, Chen K, Cai Z, Li G. All-arthroscopic versus mini-open repair of small to large sized rotator cuff tears: a meta-analysis of clinical outcomes. PLoS ONE. 2014;9(4):e94421.

(10) Lindley K, Jones GL. Outcomes of arthroscopic versus open rotator cuff repair: a systematic review of the literature. Am J Orthop. 2010;39(12):592-600.

(11) Duquin TR, Buyea C, Bisson LJ. Which method of rotator cuff repair leads to the highest rate of structural healing? A systematic review. Am J Sports Med. 2010;38(4):835-41.

(12) Cho CH, Song KS, Jung GH, Lee YK, Shin HK. Early postoperative outcomes between arthroscopic and mini-open repair for rotator cuff tears. Orthopedics. 2012;35(9):e1347-52.

(13) Kasten P, Keil C, Grieser T, Raiss P, Streich N, Loew M. Prospective randomised comparison of arthroscopic versus mini-open rotator cuff repair of the supraspinatus tendon. Int Orthop. 2011;35(11):1663-70.

(14) Mohtadi NG, Hollinshead RM, Sasyniuk TM, Fletcher JA, Chan DS, Li FX. A randomized clinical trial comparing open to arthroscopic acromioplasty with mini-open rotator cuff repair for full-thickness rotator cuff

tears: disease-specific quality of life outcome at an average 2-year follow-up. Am J Sports Med. 2008;36(6):1043-51.

(15) Baker CL, Liu SH. Comparison of open and arthroscopically assisted rotator cuff repairs. Am J Sports Med. 1995;23(1):99-104.

(16) Hata Y, Saitoh S, Murakami N, Kobayashi H, Takaoka K. Atrophy of the deltoid muscle following rotator cuff surgery. J Bone Joint Surg Am. 2004;86-a(7):1414-9.

(17) Ide J, Maeda S, Takagi K. A comparison of arthroscopic and open rotator cuff repair. Arthroscopy. 2005;21(9):1090-8.

(18) Millar NL, Wu X, Tantau R, Silverstone E, Murrell GA. Open versus two forms of arthroscopic rotator cuff repair. Clin Orthop Relat Res. 2009;467(4):966-78.

(19) Costouros JG, Von Campe A, Gerber C. Arthroscopic rotator cuff repair leads to less operative fatty infiltration than open repair. Paper presented at: 20th Congress of the European Society for Surgery of the Shoulder and the Elbow (SECEC-ESSSE 2006); 2006 Sep 20-23; Athens, Greece.

Suggested Citation

TBA

About Health Quality Ontario

Health Quality Ontario is the provincial advisor on the quality of health care in Ontario, evaluating the effectiveness of health care technologies and services, providing evidence-based recommendations, reporting to the public on the quality of the health system, and supporting the spread of quality improvement throughout the system.

About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Permission Requests

All inquiries regarding permission to reproduce any content in Health Quality Ontario reports should be directed to EvidenceInfo@hqontario.ca.

How to Obtain Rapid Reviews From Health Quality Ontario

All rapid reviews are freely available in PDF format at the following URL: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/rapid-reviews.

Conflict of Interest Statement

There are no competing interests or conflicts of interest to declare.

Public Comment

Health Quality Ontario posts draft reports and recommendations on its website for public comment prior to publication. For more information, please visit: http://www.hqontario.ca/evidence/evidence-process/evidence-review-process/professional-and-public-engagement-and-consultation.

Disclaimer

This rapid review is the work of Health Quality Ontario and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. *T*he analysis may not have captured every relevant publication, and *relevant* scientific findings may have been reported since completion of the review. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. This report is current as of the date of the literature search specified in the Research Methods section. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

© Queen's Printer for Ontario, 2015

A Rapid Review

JULY 2015

Ontario
Health Quality Ontario

Arthroscopic Debridement for Osteoarthritis of the Glenohumeral Joint

HEALTH QUALITY ONTARIO

CONTEXT

Glenohumeral osteoarthritis is a gradual breakdown of articular cartilages and other joint tissues, and is usually associated with pain, as well as a loss of motion and function. Surgical replacement of the glenohumeral joint is the typical treatment used to restore function and comfort to the joint. However, arthroscopic debridement has been suggested as a surgical option in patients who are refractory to conservative treatment.

RESEARCH QUESTION

What is the effectiveness of arthroscopic debridement with or without capsular release for patients with osteoarthritis of the glenohumeral joint?

CONCLUSION

There is no evidence on which to base conclusions regarding the comparative effectiveness of arthroscopic debridement for glenohumeral joint osteoarthritis.

Context

Objective of Rapid Review

The objective of this analysis was to determine whether arthroscopic debridement for osteoarthritis of the glenohumeral joint improves patient outcomes.

Clinical Need and Target Population

Osteoarthritis of the glenohumeral joint (shoulder joint) is a gradual, progressive, and mechanical breakdown of articular cartilages and other joint tissues, and is usually associated with pain, as well as a loss of motion and function. (1)

Increasing age, prior shoulder trauma, gender, and weight are risk factors for glenohumeral osteoarthritis. (1) The incidence of osteoarthritis of the glenohumeral joint is unclear, but it is the third most common joint to require replacement, after hip and knee, and its associated functional deficits are comparably disabling. (2)

Technology/Technique

Surgical replacement of the glenohumeral joint is the typical treatment used to restore function and comfort to the joint. Arthroscopic debridement has been suggested as a surgical option in patients who are refractory to conservative treatment (i.e., for whom conservative treatment is not effective), particularly in young or active patients who may wish to avoid or delay arthroplasty. (3) The technique involves the insertion of an arthroscope, an instrument that includes a small camera, into the joint via a small incision. The arthroscope is used to remove debris and damaged tissue from the joint. It can be performed with or without capsular release (the removal of the inflamed capsule). Debridement may alleviate mechanical symptoms such as grinding and clicking, and can stabilize cartilage lesions, thereby reducing the risk of further damage. (4)

Question, Methods, and Findings

Research Question

What is the effectiveness of arthroscopic debridement with or without capsular release for patients with osteoarthritis of the glenohumeral joint?

Methods

Research questions are developed by Health Quality Ontario (HQO), in consultation with experts, end users, and/or applicants in the topic area. HQO produces 2 types of rapid reviews: a *Rapid Review of Systematic Reviews (RRSR)* is conducted when a relevant systematic review, health technology assessment, or meta-analysis is identified; when none of these types of summary reviews are available a *Rapid Review of Primary Studies (RRPS)* is conducted. If available, the results of the meta-analyses in the RRSR are reported for applicable outcomes. In an RRPS a narrative review of the literature is provided. The restrictions of the short time frame do not permit the authors to conduct their own meta-analyses in rapid reviews.

Literature Search Strategy

A literature search was performed on October 3, 2014, using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, and EBM Reviews, for studies published from January 1, 2009, to October 3, 2014 (Appendix 1). Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search.

Inclusion Criteria

- English-language full-text publications
- articles published between January 1, 2009, and October 3, 2014
- systematic reviews and meta-analyses

Exclusion Criteria

- studies involving injury to the glenohumeral joint from an acute injury or trauma
- articles involving rheumatoid arthritis
- studies where outcomes of interest cannot be abstracted

Outcomes of Interest

- conversion to arthroplasty
- functional outcomes
- pain scores

Expert Panel

In August 2014, an Expert Advisory Panel on Episode of Care for Patients with Degenerative Disorders of the Shoulder was struck. Members of the panel included physicians, personnel from the Ministry of Health and Long-Term Care, health care administrators, and allied health professionals.

The role of the Expert Advisory Panel was to provide advice on primary patient groupings; to review the evidence, guidance, and publications related to defined patient populations; to identify and prioritize interventions for review; and to advise on the development of a care pathway model. The role of panel members was to provide advice on the scope of the project, the methods used, and the findings. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of the Expert Advisory Panel members.

Assessment of the Quality of Evidence

The Assessment of Multiple Systematic Reviews (AMSTAR) measurement tool was used to assess the methodological quality of systematic reviews. (5) The methodology for an RRPS includes a risk of bias assessment based on the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group criteria (6) to assess quality of evidence. Risk of bias is evaluated based on consideration of allocation concealment, binding, accounting of patients and outcome events, selective reporting bias, and other limitations.

The quality of the body of evidence for each outcome was examined according to the GRADE Working Group criteria. (6) The overall quality was determined to be high, moderate, low, or very low using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that randomized controlled trials (RCTs) are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. Limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors that may raise the quality of evidence were considered: the large magnitude of effect, the dose response gradient, and any residual confounding factors. (6) For more detailed information, please refer to the latest series of GRADE articles. (6)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of the effect

Findings

The database search yielded 130 citations published between January 1, 2009, and October 3, 2014 (with duplicates removed). Articles were excluded based on information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment.
One systematic review met the inclusion criteria. (7) The reference list of the included systematic review was hand-searched to identify other relevant studies, and no additional citations were included.

The quality of the included systematic review was assessed using the AMSTAR scale (5) and scored 6 out of a possible 11 (Appendix 2, Table A1). The objectives of Namdari and colleagues (7) were to critically examine the outcomes of arthroscopic debridement for glenohumeral arthritis and to perform an evidence-based synthesis of the available literature. The authors searched PubMed and EMBASE from January 1950 to September 2012 and identified 5 retrospective case series. (8-12)

A summary of the 5 studies included in the article by Namdari and colleagues (7) is presented in Table 1. All surgeries took place between 1986 and 2007. The studies ranged in sample size from 20 to 81 patients. All studies included demographic data on sex; there were 142 male patients (67%) and 70 female patients (33%).

Table 2: Demographic Details of Studies Included in Systematic Review[a]

Author, Year	Type of Study	No. of Shoulders/Patients		Mean Age in Years (Range)	Male/ Female	Mean Follow-Up in Months (Range)
		Baseline	Final			
Cameron et al, 2002 (8)	Retrospective case series	70/70	61/61	49.5 (21–73)	41/20	34 (12–29)
Guyette et al, 2002 (9)	Retrospective case series	49/49	36/36	61 (34–87)	23/13	60 (26–152)
Kerr and McCarty, 2008 (10)	Retrospective case series	20/19	20/19	38 (20–54)	12/7	20 (12–33)
Van Thiel et al, 2010 (11)	Retrospective case series	81/81	71/71	47 (18–77)	47/24	27 (12–90)
Weinstein et al, 2000 (12)	Retrospective case series	25/25	25/25	46 (27–72)	19/6	34 (12–63)

[a]As presented in Namdari and colleagues. (7)

Five case series reported on the frequency of conversion to shoulder arthroplasty, and 3 reported on the time to conversion to shoulder arthroplasty. All 5 case series provided data on scores for functional outcomes before and after arthroscopic debridement. Two case series reported on pain scores before and after arthroscopic debridement using a visual analogue scale.

However, none of the 5 case series identified included a control group. Therefore, the effect of the arthroscopic debridement could not be differentiated from naturally occurring changes over time.

Conclusions

The following conclusion can be drawn from the examination of 5 retrospective case series identified in 1 systematic review:

- There is no evidence on which to base conclusions regarding the comparative effectiveness of arthroscopic debridement for glenohumeral joint osteoarthritis.

Acknowledgements

Editorial Staff
Susan Harrison

Medical Information Services
Caroline Higgins, BA, MISt
Corinne Holubowich, BEd, MLIS

Expert Advisory Panel on Degenerative Disorders of the Shoulder

Name	Affiliation(s)	Appointment(s)
Chair		
Dr. James Waddell	St. Michael's Hospital University of Toronto, Division of Orthopaedic Surgery	Orthopaedic Surgeon Professor
Anaesthesiology		
Dr. Nick Lo	St. Michael's Hospital University of Toronto, Department of Anesthesia, Faculty of Medicine	Staff Anesthesiologist Assistant Professor
Dr. Kirit Patel	Rouge Valley Health System	Divisional Head, Anesthesiology
Executive Administration		
Leslie Gauthier	Hamilton Health Sciences	Director, Perioperative Services
Mei Lei Ling	Women's College Hospital	Clinical Manager, Surgical Services
Anne Marie MacLeod	Holland Musculoskeletal Program, Sunnybrook Health Sciences Centre	Operations Director
Rhona McGlasson	Bone and Joint Canada North Simcoe Muskoka Local Health Integration Network	Executive Director Surgical Coordinator
Tracey Reeves	Ottawa Hospital	Health Information Management Professional Coding Specialist, CHIM
Tiziana Silveri	North Bay Regional Health Centre	Vice-President of Clinical Services and Chief Nurse Executive
Physiotherapy and Rehabilitation		
Helen Razmjou	Sunnybrook Health Sciences Centre	Associate Scientist
Primary Care		
Dr. Christopher Jyu	Rouge Valley Health System	Family Physician

Name	Affiliation(s)	Appointment(s)
Orthopaedic Surgery		
Dr. Darren Drosdowech	Western University Roth McFarlane Hand and Upper Limb Centre, St. Joseph's Health Care	Associate Professor, Division of Orthopaedic Surgery
Dr. Stephen Gallay	Rouge Valley Health System	Division Head, Orthopaedics
Dr. Richard Holtby	Holland Musculoskeletal Research Program, Sunnybrook Health Sciences Centre University of Toronto, Faculty of Medicine	Affiliate Scientist Staff Surgeon Assistant Professor
Dr. Peter Lapner	The Ottawa Hospital University of Ottawa	Head, Upper Extremity Service, Division of Orthopedics Assistant Professor
Dr. Krishan Rajaratnam	McMaster University	Assistant Clinical Professor, Division of Orthopaedic Surgery

Appendices

Appendix 6: Research Methods

Search Results

Search date: October 3, 2014
Databases searched: Ovid MEDLINE, Ovid MEDLINE In-Process All EBM Databases (see below)
Limits: 2009–current; English
Filters: Meta-analyses, systematic review and health technology assessments

Databases: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to August 2014>, EBM Reviews - ACP Journal Club <1991 to September 2014>, EBM Reviews - Database of Abstracts of Reviews of Effects <3rd Quarter 2014>, EBM Reviews - Cochrane Central Register of Controlled Trials <August 2014>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <3rd Quarter 2014>, EBM Reviews - NHS Economic Evaluation Database <3rd Quarter 2014>, Ovid MEDLINE(R) <1946 to September Week 4 2014>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <October 02, 2014>
Search Strategy:

#	Searches	Results
1	Shoulder/ or Shoulder Joint/ or Rotator Cuff/	27456
2	Glenoid Cavity/ or Acromion/	1013
3	Shoulder Pain/	3392
4	Shoulder Impingement Syndrome/	1418
5	exp Tendon Injuries/	15088
6	((shoulder* adj3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff adj3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*).ti,ab.	19225
7	or/1-6	49115
8	Arthroscopy/	18129
9	Debridement/	12861
10	Joint Capsule Release/	44
11	(arthroscop* or debrid* or ((capsular or capsule) adj2 releas*)).ti,ab.	40837
12	or/8-11	50321
13	7 and 12	5833
14	Meta Analysis.pt.	52632
15	Meta-Analysis/ or Meta-Analysis as Topic/ or exp Technology Assessment, Biomedical/	75138
16	(((systematic* or methodologic*) adj3 (review* or overview*)) or pooled analysis or published studies or published literature or hand search* or handsearch* or medline or pubmed or embase or cochrane or cinahl or data synthes* or data extraction* or HTA or HTAs or (technolog* adj (assessment* or overview* or appraisal*))).ti,ab.	192057
17	(meta analy* or metaanaly* or health technolog* assess*).mp.	138713
18	or/14-17	274390
19	13 and 18	175
20	limit 19 to (english language and yr="2009 -Current") [Limit not valid in CDSR,ACP Journal Club,DARE,CLCMR; records were retained]	140
21	remove duplicates from 20	130

Appendix 2: Evidence Quality Assessment

Table A1: AMSTAR Score of Included Systematic Review

Author, Year	AMSTAR Score[a]	(1) Provided Study Design	(2) Duplicate Study Selection	(3) Broad Literature Search	(4) Considered Status of Publication	(5) Listed Excluded Studies	(6) Provided Characteristics of Studies	(7) Assessed Scientific Quality	(8) Considered Quality in Report	(9) Methods to Combine Appropriate	(10) Assessed Publication Bias	(11) Stated Conflict of Interest
Namdari et al, 2013 (7)	6	✓	✓	✓	✓	✗	✓	✗	✗	✗	✗	✓

Abbreviation: AMSTAR, Assessment of Multiple Systematic Reviews.

[a]Maximum possible score is 11. Details of AMSTAR score are described in Shea et al. (5)

References

(1) Millett PJ, Gobezie R, Boykin RE. Shoulder osteoarthritis: diagnosis and management. Am Fam Physician. 2008;78(5):605-11.

(2) Parsons IM, Weldon EJ, Titelman RM, Smith KL. Glenohumeral arthritis and its management. Phys Med Rehabil Clin N Am. 2004;15(2):447-74.

(3) Millett PJ, Horan MP, Pennock AT, Rios D. Comprehensive Arthroscopic Management (CAM) procedure: clinical results of a joint-preserving arthroscopic treatment for young, active patients with advanced shoulder osteoarthritis. Arthroscopy. 2013;29(3):440-8.

(4) Bhatia S, Hsu A, Lin EC, Chalmers P, Ellman M, Cole BJ, et al. Surgical treatment options for the young and active middle-aged patient with glenohumeral arthritis. Adv Orthop. 2012;2012:846843.

(5) Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol. 2007;7:10.

(6) Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011;64(4):380-2.

(7) Namdari S, Skelley N, Keener JD, Galatz LM, Yamaguchi K. What is the role of arthroscopic debridement for glenohumeral arthritis? A critical examination of the literature. Arthroscopy. 2013;29(8):1392-8.

(8) Cameron BD, Galatz LM, Ramsey ML, Williams GR, Iannotti JP. Non-prosthetic management of grade IV osteochondral lesions of the glenohumeral joint. J Shoulder Elbow Surg. 2002;11(1):25-32.

(9) Guyette TM, Bae H, Warren RF, Craig E, Wickiewicz TL. Results of arthroscopic subacromial decompression in patients with subacromial impingement and glenohumeral degenerative joint disease. J Shoulder Elbow Surg. 2002;11(4):299-304.

(10) Kerr BJ, McCarty EC. Outcome of arthroscopic debridement is worse for patients with glenohumeral arthritis of both sides of the joint. Clin Orthop Relat Res. 2008;466(3):634-8.

(11) Van Thiel GS, Sheehan S, Frank RM, Slabaugh M, Cole BJ, Nicholson GP, et al. Retrospective analysis of arthroscopic management of glenohumeral degenerative disease. Arthroscopy. 2010;26(11):1451-5.

(12) Weinstein DM, Bucchieri JS, Pollock RG, Flatow EL, Bigliani LU. Arthroscopic debridement of the shoulder for osteoarthritis. Arthroscopy. 2000;16(5):471-6.

Suggested Citation

TBA

About Health Quality Ontario

Health Quality Ontario is the provincial advisor on the quality of health care in Ontario, evaluating the effectiveness of health care technologies and services, providing evidence-based recommendations, reporting to the public on the quality of the health system, and supporting the spread of quality improvement throughout the system.

About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Permission Requests

All inquiries regarding permission to reproduce any content in Health Quality Ontario reports should be directed to EvidenceInfo@hqontario.ca.

How to Obtain Rapid Reviews From Health Quality Ontario

All rapid reviews are freely available in PDF format at the following URL: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/rapid-reviews.

Conflict of Interest Statement

There are no competing interests or conflicts of interest to declare.

Public Comment

Health Quality Ontario posts draft reports and recommendations on its website for public comment prior to publication. For more information, please visit: http://www.hqontario.ca/evidence/evidence-process/evidence-review-process/professional-and-public-engagement-and-consultation.

Disclaimer

This rapid review is the work of Health Quality Ontario and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. *T*he analysis may not have captured every relevant publication, and *relevant* scientific findings may have been reported since completion of the review. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. This report is current as of the date of the literature search specified in the Research Methods section. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

© Queen's Printer for Ontario, 2015

A Rapid Review

JULY 2015

Ontario
Health Quality Ontario

Hemiarthroplasty Compared With Total Arthroplasty in Shoulder Osteoarthritis

HEALTH QUALITY ONTARIO

CONTEXT

Whether hemiarthroplasty is the surgical treatment of choice compared with total arthroplasty remains controversial.

RESEARCH QUESTION

What are the clinical effectiveness and safety of hemiarthroplasty compared with total shoulder arthroplasty in the treatment of shoulder osteoarthritis?

CONCLUSION

It appears that total shoulder arthroplasty is more beneficial than hemiarthroplasty in terms of improved shoulder function. Differences between the 2 techniques with respect to risk of revision, pain, and adverse events were not shown.

Context

Objective of Rapid Review

The objective is to examine the operative treatments in arthroplasty for osteoarthritis of the shoulder.

Clinical Need and Target Population

Osteoarthritis of the shoulder is a degenerative shoulder disease that effects older populations. It begins with wearing of the cartilage and joints, leading to symptoms of pain and disability. (1) The glenohumeral joint is often the source of shoulder osteoarthritis. (2)

Technique

Current surgical options for the treatment of shoulder osteoarthritis include arthroplastic replacement. Total shoulder arthroplasty (TSA) is the gold standard surgical treatment for severe glenohumeral osteoarthritis; it involves the replacement of the humeral head and prosthetic resurfacing of the glenoid. Hemiarthroplasty as a surgical treatment involves only humeral head replacement. The controversy over which technique to use stems from complications that have been noted for the TSA technique related to the glenoid. (3)

Question, Methods, and Findings

Research Question

What are the clinical effectiveness and safety of hemiarthroplasty compared with total shoulder arthroplasty in the treatment of shoulder osteoarthritis?

Methods

Research questions are developed by Health Quality Ontario (HQO), in consultation with experts, end users, and/or applicants in the topic area. HQO produces 2 types of rapid reviews: a *Rapid Review of Systematic Reviews (RRSR)* is conducted when a relevant systematic review, health technology assessment, or meta-analysis is identified; when none of these types of summary reviews are available a *Rapid Review of Primary Studies (RRPS)* is conducted. If available, the results of the meta-analyses in the RRSR are reported for applicable outcomes. In an RRPS a narrative review of the literature is provided. The restrictions of the short time frame do not permit the authors to conduct their own meta-analyses in rapid reviews.

Literature Search Strategy

A literature search was performed on October 20, 2014, using Ovid MEDLINE, Ovid MEDLINE In-Process and Other Non-Indexed Citations, Ovid Embase, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), and EBM Reviews, for studies published from January 1, 2009, to October 20, 2014. Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search. Search results are presented in Appendix 1.

Inclusion Criteria

- English-language full-text publications
- systematic reviews, meta-analyses, and health technology assessments of randomized controlled trials (RCTs)
- studies with methods and results clearly described
- studies involving adults ≥ 18 years of age
- studies including patients experiencing severe shoulder osteoarthritis in need of surgical treatment
- studies that compared hemiarthroplasty with TSA

Exclusion Criteria

- studies that were qualitative reviews
- studies using case series, observational studies, or conference abstracts
- studies on rheumatoid arthritis
- studies on rotator cuff–deficient shoulders
- studies examining the use of other surgical interventions

Outcomes of Interest

- shoulder function, measured by the American Shoulder and Elbow Surgeons (ASES) Standardized Shoulder Assessment Form
- risk of revision
- pain, measured using the McGill Pain score/scale
- adverse events

Expert Panel

In August 2014, an Expert Advisory Panel on Episode of Care for Patients with Degenerative Disorders of the Shoulder was struck. Members of the panel included physicians, personnel from the Ministry of Health and Long-Term Care, health care administrators, and allied health professionals. The role of the Expert Advisory Panel was to provide advice on primary patient groupings; to review the evidence, guidance, and publications related to defined patient populations; to identify and prioritize interventions for review; and to advise on the development of a care pathway model. The role of panel members was to provide advice on the scope of the project, the methods used, and the findings. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of the expert panel members.

Assessment of the Quality of Evidence

The Assessment of Multiple Systematic Reviews (AMSTAR) measurement tool was used to assess the methodological quality of systematic reviews. (4)

The quality of the body of evidence for each outcome was examined according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group criteria. (5) The overall quality was determined to be high, moderate, low, or very low using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that RCTs are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. Limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 main factors that may raise the quality of evidence were considered: the large magnitude of effect, the dose response gradient, and any residual confounding factors. (5) For more detailed information, please refer to the latest series of GRADE articles. (5)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	High confidence in the effect estimate—the true effect lies close to the estimate of the effect
Moderate	Moderate confidence in the effect estimate—the true effect is likely to be close to the estimate of the effect, but may be substantially different
Low	Low confidence in the effect estimate—the true effect may be substantially different from the estimate of the effect
Very Low	Very low confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of the effect

Findings

The database search yielded 120 citations published between January 1, 2009, and October 20, 2014, (with duplicates removed). We excluded articles based on information in the title and abstract, and obtained the full texts of potentially relevant articles for further assessment.

There were 13 potentially eligible articles that underwent full-text review. Reasons for exclusion included study design (5 articles), qualitative reviews (2 articles), no access (1 article), not relevant (1 article), year prior to 2009 (1 article), and duplicate records (2 articles).

Therefore, only 1 study, which was a systematic review/meta-analysis, met the inclusion criteria. The reference lists of the included studies and health technology assessment websites were hand searched to identify other relevant studies, and no additional citations were identified, for a total of 1 study. The AMSTAR score of the article by Singh et al (6) was 10 out of a possible 11 points (Appendix 2). A summary of this 1 systematic review/meta-analysis is shown in Tables 1 and 2.

Table 1. Summary of Systematic Review

Authors, Year	Research Goal	Intervention	Literature Search Methods	Summary of Outcomes
Singh et al, 2010 (6) (Cochrane review)	To examine the benefits and harms of surgery in patients with osteoarthritis of the shoulder confirmed by radiography who do not respond to analgesics and NSAIDs	Included surgical techniques (TSA, hemiarthroplasty, arthroscopy with debridement, and others such as interpositional arthroplasty, cartilage repair/grafting) vs placebo or sham surgery, nonsurgical modalities (e.g., intra-articular corticosteroid injections, physical therapy, acupuncture), no treatment, or comparison of one type of surgical technique to another	Systematic review and meta-analysis. Searched +2 databases, up to 2009. Eligible to be included were RCTs and quasi-randomized trials. No abstracts	• Shoulder function • Risk of revision • Pain • Adverse events

Abbreviations: NSAIDs, nonsteroidal anti-inflammatory drugs; RCT, randomized controlled trial; TSA, total shoulder arthroplasty.

Table 2. Summary of Findings

Outcome	No. of Studies	Effect Size (95% CI)	Interpretation of Findings	GRADE
Shoulder function[a]	2 RCTs	MD: −10.05 (−18.97 to −1.13)	Favours TSA	Moderate
Risk of revision[b]	2 RCTs	RR: 6.18 (0.77 to 49.52)	No difference	Low
Pain[c]	1 RCT	Scale, MD: 7.80 (−5.33 to 20.93) Score, MD: 1.80 (−1.17 to 4.77)	No difference[d]	Low
Adverse events[b]	1 RCT	RR: 1.19 (0.37 to 3.81)	No difference	Low

Abbreviations: CI, confidence interval; MD, mean difference; GRADE, Grading of Recommendations Assessment, Development, and Evaluation; RCT, randomized controlled trial; RR, risk ratio; TSA, total shoulder arthroplasty.
[a]Based on American Shoulder and Elbow Surgeons Shoulder Score: 0-100, higher = better. TSA on left-hand side of plot in Cochrane analysis. Minimal clinically important difference of 6.4 points. (4)
[b]TSA on right-hand side of plot in Cochrane analysis.
[c]Based on McGill Pain Scale: 0-100, higher = worse; McGill Pain Score: 0-78, higher = worse. TSA on right-hand side of plot in Cochrane analysis.
[d]Qualitative assessment in that there is no difference between the results using the "scale" and "score" on the basis of direction and consistency.

Details of the GRADE scoring are shown in Appendix 2.

Conclusions

For patients with severe osteoarthritis requiring surgical treatment,

- based on moderate quality of evidence, there is a beneficial effect of TSA on shoulder function compared with hemiarthroplasty—the result is statistically significant and clinically meaningful;
- based on low quality of evidence, there was no difference between the 2 surgical techniques for risk of revision;
- based on low quality of evidence, there was no difference between the 2 surgical techniques for pain; and
- based on low quality of evidence, there was no difference between the 2 surgical techniques for adverse events.

Acknowledgements

Editorial Staff
Susan Harrison

Medical Information Services
Caroline Higgins, BA, MISt
Corinne Holubowich, BEd, MLIS

Expert Advisory Panel on Degenerative Disorders of the Shoulder

Name	Affiliation(s)	Appointment(s)
Chair		
Dr. James Waddell	St. Michael's Hospital University of Toronto, Division of Orthopaedic Surgery	Orthopaedic Surgeon Professor
Anaesthesiology		
Dr. Nick Lo	St. Michael's Hospital University of Toronto, Department of Anesthesia, Faculty of Medicine	Staff Anesthesiologist Assistant Professor
Dr. Kirit Patel	Rouge Valley Health System	Divisional Head, Anesthesiology
Executive Administration		
Leslie Gauthier	Hamilton Health Sciences	Director, Perioperative Services
Mei Lei Ling	Women's College Hospital	Clinical Manager, Surgical Services
Anne Marie MacLeod	Holland Musculoskeletal Program, Sunnybrook Health Sciences Centre	Operations Director
Rhona McGlasson	Bone and Joint Canada North Simcoe Muskoka Local Health Integration Network	Executive Director Surgical Coordinator
Tracey Reeves	Ottawa Hospital	Health Information Management Professional Coding Specialist, CHIM
Tiziana Silveri	North Bay Regional Health Centre	Vice-President of Clinical Services and Chief Nurse Executive
Physiotherapy and Rehabilitation		
Helen Razmjou	Sunnybrook Health Sciences Centre	Associate Scientist
Primary Care		
Dr. Christopher Jyu	Rouge Valley Health System	Family Physician

Name	Affiliation(s)	Appointment(s)
Orthopaedic Surgery		
Dr. Darren Drosdowech	Western University Roth McFarlane Hand and Upper Limb Centre, St. Joseph's Health Care	Associate Professor, Division of Orthopaedic Surgery
Dr. Stephen Gallay	Rouge Valley Health System	Division Head, Orthopaedics
Dr. Richard Holtby	Holland Musculoskeletal Research Program, Sunnybrook Health Sciences Centre University of Toronto, Faculty of Medicine	Affiliate Scientist Staff Surgeon Assistant Professor
Dr. Peter Lapner	The Ottawa Hospital University of Ottawa	Head, Upper Extremity Service, Division of Orthopedics Assistant Professor
Dr. Krishan Rajaratnam	McMaster University	Assistant Clinical Professor, Division of Orthopaedic Surgery

Appendices

Appendix 7: Research Methods

Search Results

Search date: October 20, 2014
Databases searched: Ovid MEDLINE, Ovid MEDLINE In-Process All EBM Databases (see below)
Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to September 2014>, EBM Reviews - ACP Journal Club <1991 to September 2014>, EBM Reviews - Database of Abstracts of Reviews of Effects <3rd Quarter 2014>, EBM Reviews - Cochrane Central Register of Controlled Trials <September 2014>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <3rd Quarter 2014>, EBM Reviews - NHS Economic Evaluation Database <3rd Quarter 2014>, Ovid MEDLINE(R) <1946 to October Week 2 2014>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <October 17, 2014>
Search Strategy:

---

1 Shoulder/ or Shoulder Joint/ or Rotator Cuff/ (27666)
2 Glenoid Cavity/ or Acromion/ (1024)
3 Shoulder Pain/ (3420)
4 Shoulder Impingement Syndrome/ (1429)
5 exp Tendon Injuries/ (15240)
6 ((shoulder* adj3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff adj3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*).ti,ab. (19402)
7 or/1-6 (49509)
8 Arthroscopy/ (18236)
9 Arthroplasty, Replacement/ (4685)
10 Hemiarthroplasty/ (208)
11 (hemiarthroplast* or hemi-arthroplast* or hemiprosthes#s or ((partial shoulder* or gleno*) adj5 (replacement* or arthroplast* or arthroscop* or surg* or surfac* or resurfac*))).ti,ab. (3344)
12 or/8-11 (25248)
13 7 and 12 (6096)
14 Meta Analysis.pt. (54288)
15 Meta-Analysis/ or Meta-Analysis as Topic/ or exp Technology Assessment, Biomedical/ (77326)
16 (((systematic* or methodologic*) adj3 (review* or overview*)) or pooled analysis or published studies or published literature or hand search* or handsearch* or medline or pubmed or embase or cochrane or cinahl or data synthes* or data extraction* or HTA or HTAs or (technolog* adj (assessment* or overview* or appraisal*))).ti,ab. (196186)
17 (meta analy* or metaanaly* or health technolog* assess*).mp. (141506)
18 or/14-17 (279785)
19 13 and 18 (158)
20 limit 19 to (english language and yr="2009 -Current") [Limit not valid in CDSR,ACP Journal Club,DARE,CLCMR; records were retained] (123)
21 remove duplicates from 20 (120)

Appendix 2

Table A1: Detailed AMSTAR Scores of Included Systematic Reviews

Author, Year	AMSTAR Score[a]	(1) Provided Study Design	(2) Duplicate Study Selection	(3) Broad Literature Search	(4) Considered Status of Publication	(5) Listed Excluded Studies	(6) Provided Characteristics of Studies	(7) Assessed Scientific Quality	(8) Considered Quality in Report	(9) Methods to Combine Appropriate	(10) Assessed Publication Bias	(11) Stated Conflict of Interest
Singh et al, 2010 (6)	10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Abbreviation: AMSTAR, Assessment of Multiple Systematic Reviews.

[a]Maximum possible score is 11. Each column represents a subscore: yes (1 point) or no (0 points). Details of AMSTAR score are described in Shea et al. (4)

Table A2: GRADE Evidence Profile for Comparison of Hemiarthroplasty and Total Shoulder Arthroplasty

No. of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Shoulder function							
2 RCTs	Serious limitations (−1)[a,b,c]	No serious limitations	No serious limitations	No serious limitations	Undetected	n/a	⊕⊕⊕ Moderate
Risk of revision							
2 RCTs	Serious limitations (−1)[b,c]	No serious limitations	No serious limitations	No serious limitations[d]	Undetected	n/a	⊕⊕ Low
Pain (scale)							
1 RCT	Serious limitations (−1)[a,b,c]	No serious limitations	No serious limitations	Serious limitations (−1)[e,f]	Undetected	n/a	⊕⊕ Low
Pain (score)							
1 RCT	Serious limitations (−1)[a,b,c]	No serious limitations	No serious limitations	No serious limitations[f]	Undetected	n/a	⊕⊕ Low
Adverse events							
1 RCT	Serious limitations (−1)[b,c]	No serious limitations	No serious limitations	Serious limitations (−1)[g]	Undetected	n/a	⊕⊕ Low

Abbreviations: GRADE, Grading of Recommendations Assessment, Development, and Evaluation; n/a, not applicable; RCT, randomized controlled trial.

[a]Absolute values at follow-up were used and not the mean change (difference between baseline and follow-up), which accounts for baseline values (preoperative).

[b]It is not clear whether there were any losses to follow-up over time.

[c]Allocation concealment and process of randomization not clear.

[d]Zero events in total shoulder arthroplasty group for a rare outcome; small sample sizes.

[e]Wide confidence intervals due to large standard deviations on pain scale (not shown for pain score).

[f]Small sample size.

[g]Small number of events and small sample size.

Table A3: Risk of Bias Among Randomized Controlled Trials for the Comparison of Hemiarthroplasty and Total Shoulder Arthroplasty

Author, Year	Allocation Concealment	Blinding	Complete Accounting of Patients and Outcome Events	Selective Reporting Bias	Other Limitations
Lo et al, 2005 (7)	Limitations[a]	No limitations	No limitations[b]	-	Limitations[c]
Gartsman et al, 2000 (8)	Limitations[d]	Limitations	No limitations[e]	-	Limitations[c,f]

[a]Allocation concealment was not described in detail and the process of randomization was not clear.
[b]Multiple analyses were reported (intention-to-treat analysis, efficacy analysis, and conservative efficacy) to handle patients that crossed over (hemiarthroplasty [HM] to total shoulder arthroplasty [TSA]). It is assumed that all patients were observed until 2 years; however, this is not clear from the presentation of results. Flow of study population was described.
[c]For continuous variables, the main concern is that the absolute values at follow-up were used and not the mean change (difference between baseline and follow-up), which accounts for baseline values (preoperative). Also, the study sizes were small (HM = 21 patients, TSA = 20 patients [Lo et al (7)]; HM = 22 patients, TSA = 25 patients [Gartsman et al (8)]).
[d]Allocation concealment was not described; however, the process of randomization was described.
[e]It is assumed that all patients were followed up at each time point; however, this is not clear from the presentation of results. Additionally, it is not clear which time point is presented in the results (e.g., HM group were observed for a mean of 34 months [~2.8 years] and the TSA group were observed for a mean of 36 months [3 years]. Up to 6 years of follow-up occurred in both groups.) Flow of study population was described.
[f]One-sided sample size calculation was used based on types of glenoid components.

References

(1) Millett PJ, Gobezie R, Boykin RE. Shoulder osteoarthritis: diagnosis and management. Am Fam Physician. 2008;78(5):605-11.

(2) Izquierdo R, Voloshin I, Edwards S, Freehill MQ, Stanwood W, Wiater JM, et al. Treatment of glenohumeral osteoarthritis. J Am Acad Orthop Surg. 2010;18(6):375-82.

(3) Killian ML, Cavinatto L, Galatz LM, Thomopoulos S. Recent advances in shoulder research. Arthritis Res Ther. 2012;14(3):214.

(4) Shea BJ GJ, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol. 2007;7(10):1-7.

(5) Guyatt GH, Oxman AD, Schünemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011 Apr; 64(4):380-2.

(6) Singh JA, Sperling J, Buchbinder R, McMaken K. Surgery for shoulder osteoarthritis. Cochrane Database of Systematic Reviews. 2010(10):CD008089.

(7) Lo IK, Litchfield RB, Griffin S, Faber K, Patterson SD, Kirkley A. Quality-of-life outcome following hemiarthroplasty or total shoulder arthroplasty in patients with osteoarthritis. A prospective, randomized trial. J Bone Joint Surg Am. 2005;87(10):2178-85.

(8) Gartsman GM, Roddey TS, Hammerman SM. Shoulder arthroplasty with or without resurfacing of the glenoid in patients who have osteoarthritis. J Bone Joint Surg Am. 2000;82(1):26-34.

Suggested Citation

TBA

About Health Quality Ontario

Health Quality Ontario is the provincial advisor on the quality of health care in Ontario, evaluating the effectiveness of health care technologies and services, providing evidence-based recommendations, reporting to the public on the quality of the health system, and supporting the spread of quality improvement throughout the system.

About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Permission Requests

All inquiries regarding permission to reproduce any content in Health Quality Ontario reports should be directed to EvidenceInfo@hqontario.ca.

How to Obtain Rapid Reviews From Health Quality Ontario

All rapid reviews are freely available in PDF format at the following URL: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/rapid-reviews.

Conflict of Interest Statement

There are no competing interests or conflicts of interest to declare.

Public Comment

Health Quality Ontario posts draft reports and recommendations on its website for public comment prior to publication. For more information, please visit: http://www.hqontario.ca/evidence/evidence-process/evidence-review-process/professional-and-public-engagement-and-consultation.

Disclaimer

This rapid review is the work of Health Quality Ontario and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. *T*he analysis may not have captured every relevant publication, and *relevant* scientific findings may have been reported since completion of the review. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. This report is current as of the date of the literature search specified in the Research Methods section. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

© Queen's Printer for Ontario, 2015

An Economic Rapid Review

JULY 2015

Open, Arthroscopic, and Mini-open Rotator Cuff Repair Surgery

HEALTH QUALITY ONTARIO

CONTEXT

Rotator cuff repairs can be conducted by 3 main methods: open, mini-open, and arthroscopic rotator cuff repair.

RESEARCH QUESTION

What is the cost-effectiveness of open versus arthroscopic versus mini-open rotator cuff repair for partial and full-thickness tears?

CONCLUSION

The cost-effectiveness of open versus arthroscopic versus mini-open rotator cuff repair for partial- and full-thickness tears is unknown.

Open, Arthroscopic, and Mini–open Rotator Cuff Repair Surgery: An Economic Rapid Review.
July 2015; pp. 1–13

Context

The Toronto Health Economics and Technology Assessment (THETA) Collaborative was commissioned by Health Quality Ontario to evaluate the cost-effectiveness and predict the long-term costs and effects of urgent care for transient ischemic attack (TIA). Published economic evaluations are reviewed, and the structure and inputs of the economic model used to estimate cost-effectiveness are summarized. The results of the economic analyses are presented for rapid-access TIA clinics versus hospital admission, and the budget impact of implementing each intervention is estimated.

Health Quality Ontario conducts full evidence-based analyses, including economic analyses, of health technologies being considered for use in Ontario. These analyses are then presented to the Ontario Health Technology Advisory Committee, whose mandate is to examine proposed health technologies in the context of available evidence and existing clinical practice and to provide advice and recommendations to Ontario health care practitioners, the broader health care system, and the Ontario Ministry of Health and Long-Term Care.

DISCLAIMER: Health Quality Ontario uses a standardized costing method for its economic analyses. The main cost categories and associated methods of retrieval from the province's perspective are described below.

Hospital costs: Ontario Case Costing Initiative cost data are used for in-hospital stay, emergency department visit, and day procedure costs for the designated International Classification of Diseases diagnosis codes and Canadian Classification of Health Interventions procedure codes. Adjustments may be required to reflect accuracy in the estimated costs of the diagnoses and procedures under consideration. Due to difficulties in estimating indirect costs in hospitals associated with a particular diagnosis or procedure, Health Quality Ontario normally defaults to a consideration of direct treatment costs only.

Non-hospital costs: These include physician services costs obtained from the Ontario Benefits for Physician Services, laboratory fees from the Ontario Schedule of Laboratory Fees, drug costs from the Ontario Drug Benefit Formulary, and device costs from the perspective of local health care institutions whenever possible, or from the device manufacturer.

Discounting: For cost-effectiveness analyses, a discount rate of 5% is applied (to both costs and effects/quality-adjusted life years [QALYs]), as recommended by economic guidelines.

Downstream costs: All reported downstream costs are based on assumptions of population trends (i.e., incidence, prevalence, and mortality rates), time horizon, resource utilization, patient compliance, health care patterns, market trends (i.e., rates of intervention uptake or trends in current programs in place in the province), and estimates of funding and prices. These may or may not be realized by the Ontario health care system or individual institutions and are often based on evidence from the medical literature, standard listing references, and educated hypotheses from expert panels. In cases where a deviation from this standard is used, an explanation is offered as to the reasons, the assumptions, and the revised approach.

The economic analysis represents *an estimate only*, based on the assumptions and costing methods explicitly stated above. These estimates will change if different assumptions and costing methods are applied to the analysis.

NOTE: Numbers may be rounded to the nearest decimal point, as they may be reported from an Excel spreadsheet.

Objective of Rapid Review

The objective of this rapid review is to review the economic literature related to open, arthroscopic, and mini-open rotator cuff repair for partial and full-thickness tears.

Clinical Need and Target Population

Surgical management is a feasible option for repair of the rotator cuff. This treatment has been observed to be cost-effective (1, 2) and to improve long-term clinical outcomes. (3) What remains unclear is the best method for surgical repair of the rotator cuff. There are currently 3 main surgical methods for rotator cuff repair: open, mini-open, and arthroscopic rotator cuff repair. Both the acromioplasty and cuff repair are conducted as open procedures. In mini-open repair, arthroscopic acromioplasty is followed by an open cuff repair. An all-arthroscopic repair includes arthroscopic acromioplasty and arthroscopic cuff repair. (4)

Question, Methods, and Findings

Research Question

What is the cost-effectiveness of open versus arthroscopic versus mini-open rotator cuff repair for partial and full-thickness tears?

Methods

Literature Search Strategy

A literature search was performed on September 18, 2014, using Ovid MEDLINE and Wiley Cochrane Library, to identify studies published up to September 17, 2014.

Search terms used were identical to those used in the search conducted for Health Quality Ontario's clinical evidence–based analysis on the same topic, with additional search limits to restrict results to economic studies. (Appendix 1 provides details of the search strategies.) Given the number of relevant economic articles anticipated, the economic rapid review included observational studies. Titles and abstracts were first screened by a single reviewer; then full-text articles were reviewed for relevant studies.

Inclusion Criteria

- English-language full-text publications
- population of adults requiring surgery for partial or full-thickness shoulder tears
- economic evaluations (cost-effectiveness or cost-utility studies)

Exclusion Criteria

- letters, editorials, or historical articles
- cost analyses

Outcomes of Interest

- costs
- quality-adjusted life-years (QALYs)

Expert Panel

In August 2014, an Expert Advisory Panel on Episode of Care for Patients with Degenerative Disorders of the Shoulder was struck. Members of the panel included physicians, personnel from the Ministry of Health and Long-Term Care, health care administrators, and allied health professionals.

The expert advisory panel was to provide advice on primary patient groupings; to review the evidence, guidance, and publications related to defined patient populations; to identify and prioritize interventions for review; and to advise on the development of a care pathway model. Panel members were to provide advice on the scope of the project, the methods used, and the findings. However, the statements, conclusions, and views expressed in this report do not necessarily represent the views of expert advisory panel members.

Assessment of Quality of Evidence

To determine the usefulness of each identified study for decision making, we applied a modified version of a methodology checklist for economic evaluations, developed by the National Institute for Health and Care

Excellence (NICE) in the United Kingdom. (5) The original checklist was used to inform the development of clinical guidelines by NICE; the wording of the questions was modified to remove references to guidelines and to make it Ontario specific.

Findings

The literature search identified a total of 57 citations. A preliminary review of titles and abstracts excluded 55 studies. The remaining 2 studies were reviewed in full text and excluded from the review because neither were cost-effectiveness or cost-utility analyses.

Limitations

No economic evaluations explored the cost-effectiveness of arthroscopic or mini-open surgery versus open rotator cuff surgery. The cost-effectiveness of one strategy has not been compared with another thus far.

Conclusions

Given the scarcity of studies, the cost-effectiveness of open versus arthroscopic versus mini-open rotator cuff repair for partial and full-thickness tears is unknown.

Acknowledgements

Editorial Staff
Elizabeth Jean Betsch, ELS

Medical Information Services
Caroline Higgins, BA, MISt
Corinne Holubowich, BEd, MLIS

Expert Advisory Panel on Degenerative Disorders of the Shoulder

Name	Affiliation(s)	Appointment(s)
Chair		
Dr. James Waddell	St. Michael's Hospital University of Toronto, Division of Orthopaedic Surgery	Orthopaedic Surgeon Professor
Anaesthesiology		
Dr. Nick Lo	St. Michael's Hospital University of Toronto, Department of Anesthesia, Faculty of Medicine	Staff Anesthesiologist Assistant Professor
Dr. Kirit Patel	Rouge Valley Health System	Divisional Head, Anesthesiology
Executive Administration		
Leslie Gauthier	Hamilton Health Sciences	Director, Perioperative Services
Mei Lei Ling	Women's College Hospital	Clinical Manager, Surgical Services
Anne Marie MacLeod	Holland Musculoskeletal Program, Sunnybrook Health Sciences Centre	Operations Director
Rhona McGlasson	Bone and Joint Canada North Simcoe Muskoka Local Health Integration Network	Executive Director Surgical Coordinator
Tracey Reeves	Ottawa Hospital	Health Information Management Professional Coding Specialist, CHIM
Tiziana Silveri	North Bay Regional Health Centre	Vice-President of Clinical Services and Chief Nurse Executive
Physiotherapy and Rehabilitation		
Helen Razmjou	Sunnybrook Health Sciences Centre	Associate Scientist
Primary Care		
Dr. Christopher Jyu	Rouge Valley Health System	Family Physician

Name	Affiliation(s)	Appointment(s)
Orthopaedic Surgery		
Dr. Darren Drosdowech	Western University Roth McFarlane Hand and Upper Limb Centre, St. Joseph's Health Care	Associate Professor, Division of Orthopaedic Surgery
Dr. Stephen Gallay	Rouge Valley Health System	Division Head, Orthopaedics
Dr. Richard Holtby	Holland Musculoskeletal Research Program, Sunnybrook Health Sciences Centre University of Toronto, Faculty of Medicine	Affiliate Scientist Staff Surgeon Assistant Professor
Dr. Peter Lapner	The Ottawa Hospital University of Ottawa	Head, Upper Extremity Service, Division of Orthopedics Assistant Professor
Dr. Krishan Rajaratnam	McMaster University	Assistant Clinical Professor, Division of Orthopaedic Surgery

Appendices

Appendix 8: Research Methods

Search Results

Search date: September 18, 2014
Databases searched: Ovid MEDLINE(R) 1946 to September Week 2 2014, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations September 17, 2014
Limits: English language , Humans, 2009 -Current
Filters: Economic evaluation filter

#	Searches	Results
1	Shoulder/ or Shoulder Joint/ or Rotator Cuff/ or Glenoid Cavity/ or Acromion/ or Shoulder Pain/ or Shoulder Impingement Syndrome/ or exp Tendon Injuries/ or ((shoulder* adj3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff adj3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*).ti,ab.	46570
2	Arthroscopy/ or (arthroscop* or mini-open or miniopen or MO or AA or ((open or rotator cuff*) adj3 (repair* or surg*))).ti,ab.	148062
3	economics/ or exp "costs and cost analysis"/ or economics, dental/ or exp "economics, hospital"/ or economics, medical/ or economics, nursing/ or economics, pharmaceutical/ or (economic$ or cost or costs or costly or costing or price or prices or pricing or pharmacoeconomic$ or (expenditure$ not energy) or (value adj1 money) or budget$).ti,ab.	612804
4	(((energy or oxygen) adj cost) or (metabolic adj cost) or ((energy or oxygen) adj expenditure)).ti,ab.	21129
5	(letter or editorial or historical article).pt.	1516214
6	Animals/ not (Animals/ and Humans/)	3917502
7	3 not (4 or 5 or 6)	545327
8	1 and 2 and 7	127
9	limit 8 to (english language and yr="2009 -Current")	61
10	remove duplicates from 9	57

Search date: September 18, 2014
Databases searched: Cochrane Library Databases (Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Cochrane Methodology Register, Database of Abstracts of Reviews of Effects, Health Technology Assessment
NHS Economic Evaluation Database)
Limits: English, Humans
Filters: Economic evaluation filter

ID	Search	Hits
#1	MeSH descriptor: [Shoulder] this term only	346
#2	MeSH descriptor: [Shoulder Joint] this term only	607
#3	MeSH descriptor: [Rotator Cuff] this term only	278
#4	MeSH descriptor: [Glenoid Cavity] this term only	3
#5	MeSH descriptor: [Acromion] this term only	42
#6	MeSH descriptor: [Shoulder Pain] this term only	429
#7	MeSH descriptor: [Shoulder Impingement Syndrome] this term only	157
#8	MeSH descriptor: [Tendon Injuries] explode all trees	465
#9	((shoulder* adj3 (pain* or injur* or tear* or disease* or lesion* or patholog* or degenerat* or impingement or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis)) or ((gleno* or acromion* or rotator cuff* or rotator interval* or subacromial* or supraspinatus or infraspinatus or teres minor or subscapularis) and (disease* or instabil* or tend?nitis or injur* or disorder* or lesion* or tear* or torn or rupture* or patholog* or tendinopath* or degenerat* or rupture* or arthropath* or impingement or bursitis or tend?nitis or osteoarthrit* or osteoarthro* or oa or arthrosis or arthritis or degenerat*)) or (cuff adj3 (syndrome* or injur* or lesion* or arthropath* or tear* or musculotendinous)) or bicipital tendon inflam* or impingement syndrome*):ti,ab,kw (Word variations have been searched)	747
#10	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9	2026
#11	MeSH descriptor: [Arthroscopy] this term only	1151
#12	(arthroscop* or mini-open or miniopen or MO or AA or ((open or rotator cuff*) adj3 (repair* or surg*))):ti,ab,kw (Word variations have been searched)	7580
#13	#11 or #12	7580
#14	MeSH descriptor: [Economics] this term only	57
#15	MeSH descriptor: [Costs and Cost Analysis] explode all trees	22632
#16	MeSH descriptor: [Economics, Dental] this term only	3
#17	MeSH descriptor: [Economics, Hospital] explode all trees	1637

#18	MeSH descriptor: [Economics, Medical] this term only	37
#19	MeSH descriptor: [Economics, Nursing] this term only	16
#20	MeSH descriptor: [Economics, Pharmaceutical] this term only	234
#21	(economic* or cost or costs or costly or costing or price or prices or pricing or pharmacoeconomic*) or (expenditure* not energy) or (value near/1 money) or budget*:ti,ab,kw (Word variations have been searched)	44462
#22	#14 or #15 or #16 or #17 or #18 or #19 or #20 or #21	44546
#23	((energy or oxygen) near cost) or (metabolic near cost) or ((energy or oxygen) near expenditure):ti,ab,kw (Word variations have been searched)	2300
#24	#22 not #23	44042
#25	letter or editorial or historical article:pt (Word variations have been searched)	6497
#26	#24 not #25	43946
#27	MeSH descriptor: [Animals] explode all trees	6650
#28	MeSH descriptor: [Humans] explode all trees	977
#29	#27 not (#27 and #28)	5673
#30	#26 not #29	43771
#31	#10 and #13 and #30 Publication Year from 2009 to 2014	10

References

(1) Vitale MA, Vitale MG, Zivin JG, Braman JP, Bigliani LU, Flatow EL. Rotator cuff repair: an analysis of utility scores and cost-effectiveness. J Shoulder Elbow Surg. 2007;16(2):181-7.

(2) Mather RC III, Koenig L, Acevedo D, Dall TM, Gallo P, Romeo A, et al. The societal and economic value of rotator cuff repair. J Bone Joint Surg Am. 2013;95(22):1993-2000.

(3) Galatz LM, Griggs S, Cameron BD, Iannotti JP. Prospective longitudinal analysis of postoperative shoulder function: a ten-year follow-up study of full-thickness rotator cuff tears. J Bone Joint Surg Am. 2001;83-A(7):1052-6.

(4) Churchill RS, Ghorai JK. Total cost and operating room time comparison of rotator cuff repair techniques at low, intermediate, and high volume centers: mini-open versus all-arthroscopic. J Shoulder Elbow Surg. 2010;19(5):716-21.

(5) National Institute for Health and Care Excellence. The guidelines manual: appendices B-I, Appendix G: Methodology checklist: economic evaluations [Internet]. United Kingdom: National Institute for Health and Care Excellence; 2012 [cited 2014 Oct 6]. Available from: http://publications.nice.org.uk/the-guidelines-manual-appendices-bi-pmg6b/appendix-g-methodology-checklist-economic-evaluations.

Suggested Citation

TBA

About Health Quality Ontario

Health Quality Ontario is the provincial advisor on the quality of health care in Ontario, evaluating the effectiveness of health care technologies and services, providing evidence-based recommendations, reporting to the public on the quality of the health system, and supporting the spread of quality improvement throughout the system.

About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and its research partners review the available scientific literature, making every effort to consider all relevant national and international research; collaborate with partners across relevant government branches; consult with expert advisory panels, clinical and other external experts, and developers of health technologies; and solicit any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Permission Requests

All inquiries regarding permission to reproduce any content in Health Quality Ontario reports should be directed to EvidenceInfo@hqontario.ca.

How to Obtain Rapid Reviews From Health Quality Ontario

All rapid reviews are freely available in PDF format at the following URL: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/rapid-reviews.

Conflict of Interest Statement

There are no competing interests or conflicts of interest to declare.

Public Comment

Health Quality Ontario posts draft reports and recommendations on its website for public comment prior to publication. For more information, please visit: http://www.hqontario.ca/evidence/evidence-process/evidence-review-process/professional-and-public-engagement-and-consultation.

Disclaimer

This rapid review is the work of Health Quality Ontario and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. *T*he analysis may not have captured every relevant publication, and *relevant* scientific findings may have been reported since completion of the review. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. This report is current as of the date of the literature search specified in the Research Methods section. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

Health Quality Ontario
130 Bloor Street West, 10th Floor
Toronto, Ontario
M5S 1N5
Tel: 416-323-6868
Toll Free: 1-866-623-6868
Fax: 416-323-9261
Email: EvidenceInfo@hqontario.ca
www.hqontario.ca

© Queen's Printer for Ontario, 2015