

# Audit indicators for value-based planned procedures

Lumbar spinal fusion for back pain alone and knee arthroscopy (outside accepted criteria)

June 2024

The information in this document should not replace a clinician's professional judgement.

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## Background

The Agency for Clinical Innovation (ACI) Surgical Care Network (previously known as the ACI Surgical Services Taskforce) published a practice guide on value-based surgery in December 2022 with two aims:

- Enable more clinically appropriate procedures in public hospitals and
- Promote discussion between craft groups and NSW Health.

Lumbar spinal fusion for back pain alone and knee arthroscopy (outside accepted criteria) were identified as planned procedures that are potentially of limited benefit.<sup>1</sup>

Audit indicators for asymptomatic hernia repair and laparoscopic cholecystectomy for asymptomatic gallstones was published separately in September 2022, and hysterectomy, tonsillectomy (outside accepted criteria) and myringotomy with or without grommets (outside accepted criteria) was published in February 2024.<sup>2</sup>

These documents extend the [Value-based Surgery Clinical Practice Guide](#) published in December 2022.

Sample process and outcome audit indicators are provided for lumbar spinal fusion for back pain alone and knee arthroscopy (outside accepted criteria).

## Scope

This document covers the process and outcome audit indicators for two elective procedures to promote value-based healthcare:

- lumbar spinal fusion for back pain alone
- knee arthroscopy (outside accepted criteria).

## Why and how to use the indicators

Promoting value-based care can improve the health system's overall efficiency, safety and health outcomes while maintaining or decreasing healthcare costs.<sup>3</sup> Low-value care is:

*"...use of an intervention where evidence suggests it confers no or very little benefit to patients, or risk of harm exceeds likely benefit, or, more broadly, the added costs of the intervention do not provide proportional added benefits".<sup>4, 5</sup>*

Evidence suggests that audit and feedback is an effective strategy for identifying and reducing care of potential limited benefit.<sup>6, 7</sup> Some of the reasons the procedures are considered potentially of limited benefit and should be monitored by healthcare systems are outlined in Table 1.<sup>1</sup>

The two procedures have also featured in the following Australian Atlas of Healthcare Variation series produced by the Australian Commission on Safety and Quality in Healthcare:

- Fourth Australian Atlas of Healthcare Variation, 2021<sup>8</sup>
  - Lumbar spinal fusion, 18 years and over
- Second Australian Atlas of Healthcare Variation, 2017<sup>9</sup>
  - Lumbar spinal fusion hospitalisations 18 years and over
- First Australian Atlas of Healthcare Variation, 2015
  - Lumbar spine surgery hospital admissions 18 years and over<sup>10</sup>
  - Knee arthroscopy hospital admissions 55 years and over<sup>11</sup>

**Table 1: Reasons the procedures might be considered potentially of limited benefit**

Procedure	Why is it considered potentially of limited benefit?	Australian data
Lumbar spinal fusion for back pain	Lumbar spinal fusion for low back pain has been identified as an elective procedure that has potentially limited benefits. <sup>1</sup> Most people with chronic low back pain related to degenerative disorders do not have instability. The role of spinal fusion for degenerative lumbar disc and/or facet joint osteoarthritis (OA) is limited and controversial. <sup>8</sup>	From 2015 to 2018, the rate of hospitalisation for lumbar spinal fusion was about 12 times higher in the local area with the highest rate than in the area with the lowest. There was a 4% fall in the national rate of lumbar spinal fusion, and a 25% fall in the rate of lumbar spinal fusion excluding decompression, between 2012 and 2015 and 2015 and 2018. <sup>8</sup>
Knee arthroscopy (outside accepted criteria)	<p>Strong evidence exists that patients with osteoarthritis of the knee do not benefit from arthroscopy of the joint, and that arthroscopy is not clinically beneficial for patients over the age of 50, regardless of the presence of osteoarthritis.<sup>12-15</sup></p> <p>An exception would be a meniscal root tear where there are no osteoarthritic changes or where there are mechanical symptoms, such as locking.<sup>16</sup></p> <p>Conservative management such as patient education, support for weight loss and exercise advice and pharmacological management of symptoms should be recommended initially. This would help to mitigate the impact of inappropriate surgical interventions on patients, such as the risk associated with anaesthetic agents, potential postoperative complications and recovery time.<sup>12</sup></p>	<p>From 2012 to 2013, there were 33,682 hospital admissions for knee arthroscopy. This indicated a rate of 560 admissions per 100,000 individuals aged 55 years and older (the Australian average).</p> <p>The knee arthroscopy admission rates varied widely across 304 local areas, Statistical Area Level 3 (SA3s), ranging from 185 to 1,319 per 100,000 individuals aged 55 years and older. The area with the highest rate had 7.1 times more admissions compared to the area with the lowest rate. State and territory averages also showed diversity, ranging from 264 per 100,000 individuals aged 55 years and older in the Australian Capital Territory to 980 in South Australia.</p> <p>Notably, hospital admission rates for knee arthroscopy tended to be higher</p>

		in inner and outer regional areas compared to major cities. There was a noticeable trend of increasing rates with higher socioeconomic status in major cities and inner regional areas. However, in outer regional and remote areas, this correlation with socioeconomic status was reversed. <sup>11</sup>
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Audit and feedback as a strategy to promote value-based care involves measuring and providing clinical performance data to healthcare providers over a specified period. It relates their performance to a comparator, such as professional standards or evidence-based targets. It also provides a summary of this comparison to healthcare providers to improve patient care and outcomes.<sup>17</sup> By providing a standardised and evidence-based approach to measure the quality of healthcare intervention, it encourages healthcare providers to take ownership of their performance.<sup>18</sup>

A Cochrane systematic review demonstrates a substantial evidence base (more than 140 randomised trials) and indicates that audit and feedback interventions can improve patient care. However, the effects are highly variable across clinical problems (pathophysiological changes that impact clinical management), settings and designs of interventions.<sup>17</sup> Evidence also suggests that highlighting clinical variation between actual and desired performance facilitates behaviour change in healthcare professionals and healthcare systems to address the gap.<sup>1</sup>

The audit indicators provided in the report can be used to:

- assist surgical and anaesthetic teams to make value-based clinical and operational decisions in surgical services
- provide direction and tools to monitor practice change
- establish local benchmarks.

## Methods

The indicators have been developed using a two-staged approach:

1. Targeted review of research evidence and Australian and international guidance (see Appendix 1).
2. Targeted peer review for sense-checking and to determine acceptability.

A detailed overview of the methods is outlined in Appendix 1 for lumbar spinal fusion for back pain alone and in Appendix 2 for knee arthroscopy (outside accepted criteria) respectively.

## Limitations

The targeted review of research evidence and guidance was based on a simplified review method and may not be entirely exhaustive. The indicators selected may need to be adjusted and adapted to reflect the local context across NSW Health jurisdictions.<sup>19</sup>

## Results

### **Lumbar spinal fusion for back pain alone**

The indicators were developed following a targeted review of research evidence and guidance, including 21 peer-reviewed publications and 16 identified through the grey literature including Australian and international guidance. Peer review occurred with clinicians from the Surgical Care Network between 15 November 2023 and 17 January 2024.

The key guidelines and criteria for spinal fusion are outlined in Table 2.

The proposed indicators for lumbar spinal fusion for back pain alone are outlined in Tables 3a and 3b.

**Table 2: Key guidelines and criteria for lumbar spinal fusion for back pain alone**

Guideline and recommendation	Guideline
<p>Spinal fusion surgery is not indicated as a treatment for chronic axial low back pain in most circumstances.<sup>20</sup></p> <p>“Spinal fusion may be considered for managing chronic axial low back pain if it has been caused by trauma, cancer, infection or other pathology where there is painful deformity, instability or neural compression.”<sup>20</sup></p>	<p>Spinal fusion for chronic axial low back pain, Safercare Victoria<sup>20</sup></p>
<p>Don't perform fusion surgery to treat patients with mechanical low back pain from multilevel spine degeneration in the absence of:</p> <ul style="list-style-type: none"> <li>• leg pain with or without neurologic symptoms or signs of concordant neurologic compression</li> <li>• structural pathology such as spondylolisthesis or deformity.<sup>21</sup></li> </ul>	<p>Spine, Choosing Wisely Canada<sup>21</sup></p>
<p>Don't routinely image patients with low back pain regardless of the duration of symptoms unless:</p> <ul style="list-style-type: none"> <li>• there are clinical reasons to suspect serious underlying pathology, i.e. red flags</li> <li>• imaging is necessary for the planning and/or execution of a particular evidence-based therapeutic intervention on a specific spinal condition.<sup>21</sup></li> </ul>	<p>Spine, Choosing Wisely Canada<sup>21, 22</sup></p>
<p>Best-care recommendations: treatment options for chronic axial low back pain include:</p> <ul style="list-style-type: none"> <li>• exercise</li> <li>• weight loss management when indicated</li> <li>• education and self-management psychological therapies, such as cognitive behaviour therapy</li> <li>• multidisciplinary biopsychosocial rehabilitation</li> <li>• pharmacological therapies to allow active therapy</li> <li>• physiotherapy.</li> </ul>	<p>Spinal fusion for chronic axial low back pain, Safer Care Victoria<sup>20, 22</sup></p>



**Table 3a: Proposed process indicators for lumbar spinal fusion for back pain alone**

Indicators	Measure
Volume of spinal fusion <sup>1, 19, 23-29</sup>	<p>Total number of lumbar spinal fusion procedures performed for chronic axial low back pain (all causes)</p> <p>Total number of lumbar spinal fusion procedures for chronic axial low back pain caused by:</p> <ul style="list-style-type: none"> <li>• trauma</li> <li>• cancer</li> <li>• infection</li> <li>• painful deformity</li> <li>• instability</li> <li>• spinal stenosis</li> <li>• chronic low back pain only</li> <li>• other pathology (not listed above)</li> </ul>
Identification of potentially inappropriate referrals for surgery <sup>1, 28-31</sup>	<p>Percentage of lumbar spinal fusion procedures performed for patients with chronic axial low back pain only</p> <p>Frequency of requests for admission for lumbar spinal fusion for patients not meeting accepted clinical indication that do not proceed to surgical intervention</p>
Timely access to surgical care <sup>1, 19, 30</sup>	<p>Percentage of lumbar spinal fusion procedures performed within appropriate clinical urgency category</p> <p>Number of overdue patients on elective surgery waiting list for spinal fusion meeting accepted clinical criteria</p> <p>Median and average wait time for elective lumbar spinal fusion for patients meeting accepted clinical criteria</p>
Team-based surgical care <sup>1, 22, 32</sup>	<p>Number of potentially inappropriate referrals for which exemption to perform the procedure has been sought</p> <p>Number of referrals for lumbar spinal fusion which do not proceed to surgical intervention</p>
Established communication pathways <sup>33</sup>	<p>Percentage of potentially inappropriate referrals with documented communication back to referring physician</p>
Patient co-morbidities <sup>34, 35, 36</sup>	<p>Percentage of patients scheduled for lumbar spinal fusion with:</p> <ul style="list-style-type: none"> <li>• diabetes</li> <li>• hypertension</li> <li>• chronic pulmonary conditions</li> <li>• cardiovascular disease</li> <li>• asthma</li> <li>• renal disease</li> <li>• liver disease</li> <li>• dementia</li> <li>• cancer</li> <li>• depression</li> <li>• osteoporosis</li> <li>• osteoarthritis</li> <li>• neurological disorders</li> <li>• obesity</li> </ul>

Indicators	Measure
High-risk groups <sup>17</sup>	<p>Percentage of patients scheduled for lumbar spinal fusion procedures who identified as:</p> <ul style="list-style-type: none"> <li>• Aboriginal but not Torres Strait Islander origin</li> <li>• Torres Strait Islander but not Aboriginal origin</li> <li>• both Aboriginal and Torres Strait Islander origin</li> <li>• neither Aboriginal nor Torres Strait Islander origin</li> </ul> <p>OR are from</p> <ul style="list-style-type: none"> <li>• culturally and linguistically diverse backgrounds</li> <li>• rural and remote areas</li> <li>• low to moderate socio-economic status</li> </ul>
Patient American Society of Anaesthesiologist (ASA) physical status <sup>37-41</sup>	<p>Percentage of patients scheduled for lumbar spinal fusion with ASA status:</p> <ul style="list-style-type: none"> <li>• ASA 1</li> <li>• ASA 2</li> <li>• ASA 3</li> <li>• ASA 4</li> </ul>
Pre-surgery management <sup>42, 43</sup>	<p>Percentage of patients scheduled for lumbar spinal fusion who have received:</p> <ul style="list-style-type: none"> <li>• alternative treatment options</li> <li>• exercise plan</li> <li>• education and self-management</li> <li>• physiotherapy</li> <li>• weight loss when indicated.</li> <li>• multidisciplinary biophysical rehabilitation</li> <li>• pharmacological treatment (to allow active therapy)</li> </ul>
Pre-surgery assessments <sup>31, 44-52</sup>	<p>Percentage of patients scheduled for lumbar spinal fusion who have completed the:</p> <ul style="list-style-type: none"> <li>• Oswestry Low Back Pain Disability Questionnaire</li> <li>• Orebro Musculoskeletal Pain Questionnaire</li> <li>• Pain Self-Efficacy Questionnaire</li> <li>• Roland-Morris Disability Questionnaire</li> <li>• Promise-29</li> <li>• EQ-5D</li> </ul>
Perioperative shared decision making <sup>43, 53</sup>	<p>Percentage of patients consenting for lumbar spinal fusion who were informed about treatment options that included:</p> <ul style="list-style-type: none"> <li>• non-operative treatment options</li> <li>• alternative surgical options</li> <li>• risk versus benefits of treatment options</li> </ul>
Intraoperative operating time <sup>31, 37, 42</sup>	<p>Length of operating time for patients undergoing lumbar spinal fusion surgery</p>

Indicators	Measure
Intraoperative specialty of proceduralist	Percentage of specialist proceduralists with the title of: <ul style="list-style-type: none"> <li>• orthopaedic surgeon</li> <li>• neurosurgeon</li> </ul>
Intraoperative grade of proceduralist <sup>54</sup>	Grade of surgeon or proceduralist performing the lumbar spinal fusion: <ul style="list-style-type: none"> <li>• consultant</li> <li>• advanced surgical trainee</li> <li>• registrar</li> <li>• basic surgical trainee</li> <li>• general practice surgeon</li> <li>• other</li> </ul>
Intraoperative navigation tools <sup>31</sup>	Percentage of patients who underwent lumbar spinal fusion surgery that used navigation tools based on image guidance: <ul style="list-style-type: none"> <li>• robotic guidance</li> <li>• computed tomography (CT) image-guided navigation</li> <li>• intraoperative O-arm system</li> <li>• increased image intensifier (II) (C-arm)</li> <li>• 7D Surgical Flash Navigation System</li> <li>• Brainlab software</li> <li>• other</li> </ul>
Intraoperative antibiotic use <sup>31, 41, 55</sup>	Percentage of patients who underwent lumbar spinal fusion surgery who received prophylactic intraoperative antibiotics
Intraoperative surgical approach <sup>31, 37</sup>	Percentage of patients who underwent lumbar spinal fusion surgery who had: <ul style="list-style-type: none"> <li>• anterior approach</li> <li>• posterior approach</li> <li>• lateral approach</li> <li>• combined-anterior-posterior approach</li> </ul>
Intraoperative procedural complexity <sup>23, 31</sup>	Percentage of patients who underwent: <ul style="list-style-type: none"> <li>• simple fusions (1-2 levels)</li> <li>• complex fusions (more than 2 levels)</li> </ul>
Intraoperative neuromonitoring <sup>31</sup>	Percentage of patients who underwent lumbar spinal fusion surgery who had intraoperative neuromonitoring
Intraoperative blood loss <sup>41, 42</sup>	Percentage of patients who underwent lumbar spinal fusion surgery who had blood loss requiring a transfusion

**Table 3b: Proposed outcome indicators for lumbar spinal fusion for back pain alone**

Indicators	Measure
Postoperative management <sup>56</sup>	Percentage of patients who underwent lumbar spinal fusion surgery with appropriate risk criteria and required an unplanned stay in: <ul style="list-style-type: none"> <li>intensive care unit (ICU)</li> <li>high dependency unit</li> </ul>
Postoperative pain management <sup>57</sup>	Percentage of patients undergoing lumbar spinal fusion who received: <ul style="list-style-type: none"> <li>oral analgesia</li> <li>intravenous analgesia, e.g. patient-controlled analgesia</li> </ul>
Postoperative complications short term <sup>8, 37, 42</sup>	Percentage of patients who underwent lumbar spinal fusion surgery and developed the following complications: <ul style="list-style-type: none"> <li>infection</li> <li>haemorrhage or bleeding</li> <li>new neurological deficit, e.g. foot drop</li> <li>anaemia</li> <li>urinary retention</li> <li>venous thromboembolism</li> <li>pulmonary complications, e.g. pneumonia</li> </ul>
Revision of surgery	Percentage of patients who underwent lumbar spinal fusion surgery and needed reoperation within 24 months from the indexed admission <sup>42</sup>
Adverse events and complications <sup>37</sup>	Percentage of patients undergoing lumbar spinal fusion surgery that had an adverse event or complications, such as: <ul style="list-style-type: none"> <li>intraoperative dural injury</li> <li>nerve injury</li> <li>vascular injury</li> <li>anaesthetic complication</li> <li>other</li> </ul>
Average length of stay <sup>58</sup>	Average length of stay for acute episode of care in patients undergoing lumbar spinal fusion surgery
Unplanned emergency department (ED) presentation <sup>59</sup>	Percentage of unplanned ED presentation to hospital within 30 days of discharge of patients who underwent lumbar spinal fusion surgery (all indications)  Percentage of unplanned ED presentation to hospital within 30 days of discharge of patient who underwent lumbar spinal fusion surgery for chronic axial low back pain only
Unplanned readmission <sup>60</sup>	Percentage of unplanned readmission to hospital within 30 days of discharge in patients who underwent lumbar spinal fusion surgery (all indications)  Percentage of unplanned readmission to hospital within 30 days of discharge in patients who underwent for lumbar spinal fusion surgery for chronic axial low back pain only

Indicators	Measure
Unplanned return to theatre during the initial episode of care <sup>59</sup>	<p>Percentage of unplanned return to theatres postoperatively (e.g. for postoperative hemorrhage) in patients who underwent spinal fusion surgery (all indications)</p> <p>Percentage of unplanned return to theatres postoperatively in patients who underwent lumbar spinal fusion surgery for chronic axial low back pain only</p>
Unplanned ICU admission <sup>54, 59</sup>	<p>Percentage of unplanned ICU postoperatively (e.g. for postoperative hemorrhage, respiratory complications) in patients who underwent lumbar spinal fusion surgery (all indications)</p> <p>Percentage of unplanned ICU postoperatively in patients who underwent lumbar spinal fusion surgery for chronic axial low back pain only</p>
Revision of surgery	Percentage of patients who have subsequent lumbar spinal fusion surgery within five years of the initial operation <sup>42, 61</sup>
Postoperative conservative management (pain clinics)	Percentage of patients who are referred to chronic pain services or other hospital services after lumbar spinal fusion surgery
30-day mortality <sup>59</sup>	<p>Rate of mortality at 30 days post operation in patients undergoing lumbar spinal fusion surgery (all indications)</p> <p>Rate of mortality at 30 days post operation in patients who underwent lumbar spinal fusion surgery for chronic axial low back pain only</p>
Patient-reported experience measures (PREM) and patient-reported outcome measure (PROM)	Survey results and action arising from point-of-care data capture and use of PROM and PREM via the Health Outcomes and Patient Experience platform (HOPE)

## Knee arthroscopy (outside accepted criteria)

The indicators were developed following a targeted review of research evidence and guidance, including 21 peer-reviewed publications and 16 identified through the grey literature including Australian and international guidance. Peer review occurred with clinicians from the Surgical Care Network experts between 1 December 2023 and 17 January 2024.

The key guidelines and criteria for knee arthroscopy (outside accepted criteria) are outlined in Table 4.

The proposed indicators are outlined in Tables 5a and 5b.

**Table 4: Key guidelines and criteria for knee arthroscopy (outside accepted criteria)**

Guideline and recommendation	Guideline
Arthroscopic knee procedures, including lavage, debridement, and partial meniscectomy, should not be used to treat a patient with uncomplicated knee osteoarthritis, as it does not alter the natural history of knee osteoarthritis.	Safer Care Victoria <sup>62, 63</sup>
Do not perform arthroscopy with lavage and/or debridement or partial meniscectomy for patients with symptomatic osteoarthritis of the knee and/or degenerate meniscal tear.	Choosing Wisely, Australia <sup>63-65</sup>
Referral for arthroscopic lavage and debridement should not be offered as part of treatment for osteoarthritis unless the person has knee osteoarthritis with a clear history of mechanical locking ('giving way' or X-ray evidence of loose bodies).	National Institute for Health Care Excellence (NICE) Guidance, United Kingdom <sup>66</sup>
Don't use arthroscopic debridement as a primary treatment in the management of osteoarthritis of the knee.	Orthopaedics, Choosing Wisely Canada <sup>67</sup>
Don't order a knee magnetic resonance imaging (MRI) when weight-bearing X-rays demonstrate osteoarthritis and symptoms are suggestive of osteoarthritis. The MRI rarely adds useful information to guide diagnosis or treatment.	Orthopaedics, Choosing Wisely Canada <sup>67</sup>
Don't use needle lavage to treat patients with symptomatic osteoarthritis of the knee for long-term relief.	Orthopaedics, Choosing Wisely Canada <sup>67</sup>

**Table 5a: Proposed process indicators for knee arthroscopy (outside accepted criteria)**

Indicators for knee arthroscopy	Measure
Volume of knee arthroscopies <sup>68</sup>	<p>Total number of knee arthroscopic procedures performed in the presence of osteoarthritis</p> <p>Total number of knee arthroscopy procedures with osteoarthritis and the following indications:</p> <ul style="list-style-type: none"> <li>• known or suspected septic arthritis</li> <li>• symptomatic non-repairable meniscal tears</li> <li>• symptomatic loose bodies</li> <li>• surgeon assessed locked or locking knees</li> <li>• traumatic or atraumatic meniscal tears</li> <li>• inflammatory arthroplasty requiring synovectomy</li> <li>• synovial pathology requiring biopsy or resection</li> <li>• large unstable chondral pathology causing surgeon assessed locking or locked knee</li> <li>• as an adjunct to and in combination with other surgical procedures as appropriate for osteoarthritis, e.g. high tibial osteotomy and patella-femoral realignment</li> <li>• diagnostic arthroscopy when the diagnosis is unclear on MRI or MRI is not possible, and the symptoms are not of osteoarthritis</li> </ul>
Identification of potentially inappropriate referrals for surgery <sup>8</sup>	<p>Percentage of knee arthroscopy procedures performed for patients with osteoarthritis only</p> <p>Frequency of requests for admission for knee arthroscopy for patients with osteoarthritis only that do not proceed to surgical intervention</p>
Timely access to surgical care <sup>1</sup>	<p>Percentage of knee arthroscopy procedures performed within appropriate clinical urgency category</p> <p>Number of overdue patients on elective surgery waiting list for knee arthroscopy in the presence of osteoarthritis</p> <p>Median and average wait time for elective knee arthroscopy in the presence of osteoarthritis</p>
Team-based surgical care <sup>1</sup>	<p>Number of potentially inappropriate referrals for which exemption to perform the procedure has been sought</p> <p>Number of referrals for knee arthroscopy for osteoarthritis only that do not proceed to surgical intervention</p>
Established communication pathways <sup>1</sup>	<p>Percentage of potentially inappropriate referrals with documented communication back to referring physician</p>
High-risk group <sup>69, 70</sup>	<p>Percentage of patients scheduled for knee arthroscopy procedures in the presence of osteoarthritis who identified as:</p> <ul style="list-style-type: none"> <li>• Aboriginal but not Torres Strait Islander origin</li> <li>• Torres Strait Islander but not Aboriginal origin</li> <li>• both Aboriginal and Torres Strait Islander origin</li> <li>• neither Aboriginal nor Torres Strait Islander origin</li> </ul>

Indicators for knee arthroscopy	Measure
	<p>OR are from</p> <ul style="list-style-type: none"> <li>• culturally and linguistically diverse backgrounds</li> <li>• rural and remote areas</li> <li>• low to moderate socio-economic status</li> </ul>
Patient co-morbidities	<p>Percentage of patients scheduled for knee arthroscopy in the presence of osteoarthritis with:</p> <ul style="list-style-type: none"> <li>• diabetes</li> <li>• history of deep vein thrombosis</li> <li>• high blood pressure</li> <li>• chronic pulmonary conditions</li> <li>• cardiovascular disease</li> <li>• asthma</li> <li>• renal disease</li> <li>• liver disease</li> <li>• cancer</li> <li>• depression</li> <li>• osteoporosis</li> <li>• obesity</li> <li>• other lower limb joint involvement or pain</li> </ul>
Patient ASA status <sup>37-39</sup>	<p>Percentage of patients scheduled for knee arthroscopy in the presence of osteoarthritis with ASA status:</p> <ul style="list-style-type: none"> <li>• ASA 1</li> <li>• ASA 2</li> <li>• ASA 3</li> <li>• ASA 4</li> </ul>
Pre-surgery management <sup>71-77</sup>	<p>Percentage of patients scheduled for knee arthroscopy in the presence of osteoarthritis who have received:</p> <ul style="list-style-type: none"> <li>• joint protection techniques, e.g. weight loss if needed, decrease in weight bearing activities, walking aids, program of rest and exercise, application of heat and cold</li> <li>• pharmacological therapy, e.g. topical, oral non-steroidal anti-inflammatory drugs (NSAID), oral analgesics, injectable corticosteroids, opioids</li> <li>• documented advice on physical activity and exercise</li> <li>• documented individualised weight management and nutrition plan</li> <li>• documented review by rheumatologist or specialist surgeon as part of monitoring</li> </ul>
Pre-surgery assessments	<p>Percentage of patients scheduled for knee arthroscopy procedures in the presence of osteoarthritis who received multidisciplinary management of care plan, for example:</p> <ul style="list-style-type: none"> <li>• Chronic Disease Management – General Practitioner Management Plan and Team Care Arrangement 512 (Medicare Benefits Schedule)<sup>78</sup></li> <li>• Osteoarthritis Chronic Care Program (NSW)<sup>78</sup></li> </ul>



Indicators for knee arthroscopy	Measure
Pre-surgery, patient selection <sup>37</sup>	<p>Percentage of patients scheduled for knee arthroscopy surgery in the presence of osteoarthritis within the following age groups:</p> <ul style="list-style-type: none"> <li>• younger than 50 years</li> <li>• 50 years or older.</li> </ul>
Pre-surgery support assessments	<p>Percentage of knee arthroscopy procedures done for patients with osteoarthritis who received documented pre-surgery assessments, for example:</p> <ul style="list-style-type: none"> <li>• Knee injury and Osteoarthritis Outcome Score (KOOS)<sup>79-81</sup></li> <li>• Visual Analogue Scale (VAS)<sup>82, 83</sup></li> <li>• Workplace Activity Limitations Scale (WALS)<sup>84, 85</sup></li> <li>• Osteoarthritis Knowledge scale<sup>86</sup></li> <li>• Oxford Knee Score<sup>87, 88</sup></li> </ul>
Pre-surgery radiological assessments	<p>Percentage of patients scheduled for knee arthroscopy in the presence of osteoarthritis who received imaging results or reports with a diagnosis of knee osteoarthritis such as:<sup>89, 90</sup></p> <ul style="list-style-type: none"> <li>• X-ray</li> <li>• CT scan</li> <li>• MRI</li> </ul>
Pre-operative conservative management	<p>Percentage of patients scheduled for knee arthroscopy in the presence of osteoarthritis who had been referred to a:</p> <ul style="list-style-type: none"> <li>• general practitioner</li> <li>• rheumatologist</li> <li>• sport or exercise physician</li> <li>• dietitian</li> <li>• physiotherapist</li> <li>• psychologist</li> <li>• social worker</li> <li>• occupational therapist</li> <li>• exercise physiologist</li> </ul>
Perioperative shared decision making	<p>Percentage of patients consenting for knee arthroscopy in the presence of osteoarthritis who were informed about treatment options that included:</p> <ul style="list-style-type: none"> <li>• alternative treatment options</li> <li>• alternative surgical options</li> <li>• risk versus benefits of treatment options</li> </ul>
Intraoperative operating time <sup>31, 37, 42</sup>	<p>Length of operating time for patients undergoing knee arthroscopy surgery in the presence of osteoarthritis</p>

Intraoperative grade of proceduralist	Grade of surgeon or proceduralist performing the knee arthroscopy surgery in the presence of osteoarthritis: <ul style="list-style-type: none"><li>• consultant</li><li>• advanced surgical trainee</li><li>• registrar</li><li>• basic surgical trainee</li><li>• general practice surgeon</li><li>• other</li></ul>
Intraoperative venous thromboembolism prophylaxis	Percentage of patients who underwent knee arthroscopy surgery in the presence of osteoarthritis who received appropriate venous embolic thromboembolism prophylaxis
Intraoperative antibiotic <sup>55, 91</sup>	Percentage of patients who underwent knee arthroscopy surgery in the presence of osteoarthritis who received prophylactic antibiotics

**Table 5b: Proposed outcome indicators for knee arthroscopy (outside accepted criteria)**

Indicators for knee arthroscopy	Measure
Postoperative management	Percentage of patients who underwent knee arthroscopy surgery in the presence of osteoarthritis and required an unplanned stay in: <ul style="list-style-type: none"> <li>• ICU</li> <li>• high dependency unit</li> </ul>
Postoperative complications (short-term) <sup>8, 37, 42, 92</sup>	Percentage of patients who underwent knee arthroscopy surgery in the presence of osteoarthritis and developed the following complications: <ul style="list-style-type: none"> <li>• deep vein thrombosis</li> <li>• pulmonary embolism</li> <li>• osteonecrosis</li> <li>• compartment syndrome</li> <li>• haemorrhage</li> <li>• infection</li> </ul>
Postoperative complications (long-term) <sup>42</sup>	Percentage of patients who underwent knee arthroscopy surgery in the presence of osteoarthritis and developed the following long-term complications such as: <ul style="list-style-type: none"> <li>• subsequent knee surgery, e.g. repeat arthroscopy, arthroplasty</li> <li>• loss of range of motion</li> <li>• chondromalacia</li> <li>• persistent pain</li> <li>• recurrent symptoms</li> </ul>
Postoperative complications	Percentage of patients who underwent knee arthroscopy surgery in the presence of osteoarthritis and had a total knee replacement on the same knee in 12 months
Adverse events and complications <sup>37</sup>	Percentage of patients undergoing knee arthroscopy surgery in the presence of osteoarthritis that had an adverse event or complications such as: <ul style="list-style-type: none"> <li>• intraoperative injury</li> <li>• nerve injury</li> <li>• vascular injury</li> <li>• anaesthetic complication</li> <li>• other</li> </ul>
Discharge advice	Percentage of patients undergoing knee arthroscopy in the presence of osteoarthritis who received: <ul style="list-style-type: none"> <li>• postoperative management instructions</li> <li>• pain management information, such as pamphlets and advice</li> <li>• a referral to a physiotherapist, exercise physiologist, other allied health as required</li> <li>• postoperative appointment with medical team</li> </ul>
Unplanned return to theatre <sup>59</sup>	Rate of unplanned return to theatres postoperatively (e.g. for postoperative hemorrhage) in patients who underwent knee arthroscopy surgery in the presence of osteoarthritis

Indicators for knee arthroscopy	Measure
	Rate of unplanned return to theatres postoperatively in patients who underwent knee arthroscopy for osteoarthritis only
Average length of stay	<p>Average length of stay for acute episode of care in patients undergoing knee arthroscopy surgery in the presence of osteoarthritis</p> <p>Percentage of knee arthroscopy surgery in the presence of osteoarthritis completed as day stay cases</p> <p>Percentage of knee arthroscopy surgery in the presence of osteoarthritis completed as overnight admissions</p>
Unplanned ED presentation	<p>Percentage of unplanned ED presentation to hospital within 30 days of discharge of patients who underwent knee arthroscopy surgery in the presence of osteoarthritis</p> <p>Percentage of unplanned ED presentation to hospital within 30 days of discharge of patient who underwent knee arthroscopy surgery for osteoarthritis only</p>
Unplanned readmission <sup>60</sup>	<p>Rate of unplanned readmission to hospital within 30 days of discharge in patients who underwent knee arthroscopy surgery in the presence of osteoarthritis</p> <p>Rate of unplanned readmission to hospital within 30 days of discharge in patients who underwent knee arthroscopy for osteoarthritis only</p>
30-day mortality <sup>59</sup>	<p>Rate of mortality at 30 days post operation in patients who underwent knee arthroscopy surgery in the presence of osteoarthritis</p> <p>Rate of mortality at 30 days post operation in patients who underwent knee arthroscopy for osteoarthritis only</p>
Patient-reported experience measures (PREM) and patient-reported outcome measure (PROM)	Survey results and action arising from point-of-care data capture and use of PROM and PREM via the Health Outcomes and Patient Experience platform (HOPE)

# Appendix 1. Lumbar spinal fusion for back pain alone

## Methods for peer-reviewed and grey literature

### Peer-reviewed literature

PubMed was searched on the 30 May 2023 using the following search terms:  
(("spinal fusion"[Title/Abstract] OR "lumbar fusion"[Title/Abstract]) AND ("low back pain"[Title/Abstract] OR "low back pain"[MeSH Terms])) AND ((humans [Filter]) AND (English [Filter]) AND (2013:2023[pdat]))

### Grey literature

Google was searched between 18 April 2023 and 7 June 2023 using the following search terms: "spinal fusion" and "low back pain" and "quality" or "surgical procedures."

## Appendix 2. Knee arthroscopy (outside accepted criteria)

### Methods for peer-reviewed and grey literature

#### Peer-reviewed literature

PubMed was searched on the 5 September 2023 using the following search terms: (("arthroscopy"[MeSH Terms] OR "arthroscopy"[Title/Abstract]) AND "knee"[Title/Abstract]) AND ((clinical trial [Filter] OR meta-analysis [Filter] OR systematic review [Filter]) AND (humans [Filter]) AND (english [Filter]) AND (2019:2023[pdat]))

#### Grey literature

Google was searched between 10 September 2023 and 19 September 2023 using the following search terms: "knee" and "arthroscopy" and "minimally invasive" and "quality" or "surgical procedures".

## Appendix 3. Sample audit tools

The following audit tools can be used to collect and collate patient level information obtained from medical record documentation and from electronic systems (e.g. Health Information Exchange, Activity Based Management Portal), to assist surgical and anaesthetic teams in making value-based clinical and operational decisions in surgical services and to provide direction and tools to monitor practice change over time. These are not exhaustive. Rather, they are intended to guide the development of local audit tools.

**Table 6: Sample audit tool for lumbar spinal fusion for back pain alone**

Lumbar spinal fusion for back pain alone		Data source
1.	What was the admission date? [dd/mm/yyyy]	Medical record Electronic systems
2.	What was the discharge date? [dd/mm/yyyy]	Medical record Electronic systems
3.	What was the patient's age on admission?	Medical record Electronic systems
4.	What was the clinical urgency category documented on the recommendation for admission (RFA) form? <ul style="list-style-type: none"> <li>• Category 1 – urgent (30 days)</li> <li>• Category 2 – semi-urgent (90 days)</li> <li>• Category 3 – non-urgent (365 days)</li> <li>• None documented</li> </ul>	RFA form
5.	What date was the RFA completed? [dd/mm/yyyy]	RFA form
6.	What was the indication for surgery? <ul style="list-style-type: none"> <li>• Trauma</li> <li>• Cancer</li> <li>• Infection</li> <li>• Painful deformity</li> <li>• Instability</li> <li>• Spinal stenosis</li> <li>• Chronic low back pain only</li> <li>• Other pathology (not listed above)</li> </ul>	RFA form Pre-admission clinic notes Correspondence from general practitioner or other specialists Admission notes
7.	What date was the procedure performed? [dd/mm/yyyy]	Operation report

Lumbar spinal fusion for back pain alone		Data source
8.	<p>What was the approach used for spinal fusion?</p> <ul style="list-style-type: none"> <li>• Anterior approach</li> <li>• Posterior approach</li> <li>• Lateral approach</li> <li>• Combined-anterior-posterior approach</li> <li>• Other (specify)</li> </ul>	Operation report
9.	<p>How many levels were fused?</p> <ul style="list-style-type: none"> <li>• One</li> <li>• Two</li> <li>• Less than two</li> </ul>	Operation report
10.	<p>Did the patient experience any of the following adverse event or complications?</p> <ul style="list-style-type: none"> <li>• Intraoperative dural injury</li> <li>• Nerve injury</li> <li>• Vascular Injury</li> <li>• Anaesthetic complication</li> <li>• Infection</li> <li>• Haemorrhage or bleeding</li> <li>• New neurological deficit, e.g. foot drop</li> <li>• Anaemia</li> <li>• Urinary retention</li> <li>• Venous thromboembolism</li> <li>• Pulmonary complications, e.g. pneumonia</li> <li>• Other (specify)</li> </ul>	Medical record Operation report
11.	<p>Was there an unplanned return to theatre postoperatively?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Medical record Electronic systems
12.	<p>What was the reason for the return to theatre?</p>	Medical record Electronic systems
13.	<p>Was the patient admitted to the intensive care unit (ICU) for care?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Medical record
14.	<p>Was this an unplanned admission to ICU postoperatively?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Medical record
15.	<p>What was the reason for the ICU admission?</p>	Medical record



Lumbar spinal fusion for back pain alone		Data source
16.	Did the patient die within 30 days of surgery? <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	Medical record
17.	Patient reported experience measures (PREM) and patient reported outcome measure (PROM)	Survey results and action arising from point of care data capture and use of PROM and PREM via the HOPE platform

**Table 7: Sample audit tool for knee arthroscopy (outside accepted criteria)**

Knee arthroscopy (outside accepted criteria)		Data source
1.	What was the admission date? [dd/mm/yyyy]	Medical record Electronic systems
2.	What was the discharge date? [dd/mm/yyyy]	Medical record Electronic systems
3.	What was the patient's age on admission?	Medical record Electronic systems
4.	What was the clinical urgency category documented on the recommendation for admission (RFA) form? <ul style="list-style-type: none"> <li>• Category 1 – urgent (30 days)</li> <li>• Category 2 – semi-urgent (90 days)</li> <li>• Category 3 – non-urgent (365 days)</li> <li>• None documented</li> </ul>	RFA form
5.	What date was the RFA completed? [dd/mm/yyyy]	RFA form
6.	What was the indication for surgery? <ul style="list-style-type: none"> <li>• Osteoarthritis</li> <li>• Known or suspected septic arthritis</li> <li>• Symptomatic non-repairable meniscal tears</li> <li>• Symptomatic loose bodies</li> <li>• Surgeon assessed locked or locking knees</li> <li>• Traumatic or atraumatic meniscal tears</li> <li>• Inflammatory arthroplasty requiring synovectomy</li> <li>• Synovial pathology requiring biopsy or resection</li> <li>• Large unstable chondral pathology causing surgeon assessed locking or locked knee</li> <li>• As an adjunct to, and in combination with other surgical procedures as appropriate for osteoarthritis, for e.g. high tibial osteotomy and patella-femoral realignment</li> <li>• Diagnostic arthroscopy when the diagnosis is unclear on MRI or MRI is not possible, and the symptoms are not of osteoarthritis</li> <li>• Other (specify)</li> </ul>	RFA form Pre-admission clinic notes Correspondence from example general practitioner or other specialists Admission notes

7.	<p>Did the patient have any of the following co-morbidities?</p> <ul style="list-style-type: none"> <li>• Other (specify)</li> <li>• Diabetes</li> <li>• History of deep vein thrombosis</li> <li>• High blood pressure</li> <li>• Chronic pulmonary conditions</li> <li>• Cardiovascular disease</li> <li>• Asthma</li> <li>• Renal disease</li> <li>• Liver disease</li> <li>• Cancer</li> <li>• Depression</li> <li>• Osteoporosis</li> <li>• Obesity</li> <li>• Other lower limb joint involvement/pain</li> <li>• Other (specify)</li> </ul>	Medical record
8.	<p>What date was the RFA completed? [dd/mm/yyyy]</p>	Operation report
9.	<p>Was there an unplanned return to theatre postoperatively?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	<p>Medical record Operation report</p>
10.	<p>What was the reason for the return to theatre?</p>	
11.	<p>Was there an unplanned readmission to the same hospital or hospital in same local health district within 30 days of discharge?</p> <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	<p>Medical record Electronic systems</p>
12.	<p>What was the reason for the readmission?</p>	Medical record
13.	<p>Patient reported experience measures (PREM) and patient reported outcome measure (PROM)</p>	<p>Survey results and action arising from point-of-care data capture and use of PROM and PREM via the HOPE platform</p>

## Appendix 4. Audit and feedback interventions

### What is audit and feedback?

Audit and feedback interventions involve defining standards in a particular area of clinical care, measuring performance against those standards over a specified period and providing that performance information back to clinicians. Two groups of measures can be used to evaluate the quality and effectiveness of healthcare: process and outcome clinical indicators.

Process clinical indicators measure the performance of specific healthcare activities that are intended to improve patient care. These indicators focus on evaluating the adherence to established guidelines, recommendations, protocols, and/or best practices. Process indicators help clinicians assess whether they are delivering care in a consistent and standardised manner. Examples include the percentage of patients who receive appropriate vaccinations, the rate of timely access to surgery, or compliance with venous thromboembolic prophylaxis protocols.

Outcome clinical indicators assess the results or consequences of healthcare interventions or treatments on the patient's health status. These indicators focus on measuring outcomes of care such as patient experience, mortality rates or complication rates. They provide insight into the effectiveness and impact of interventions and help identify areas for improvement.

### Does audit and feedback work?

A Cochrane systematic review included more than 140 randomised trials and found that audit and feedback interventions, on average, lead to improvements in patient care. However, the effects are highly variable across clinical problems, settings and designs of interventions.<sup>17</sup>

Evidence also suggests that highlighting clinical variation between actual and desired performance facilitates behaviour change in healthcare professionals and healthcare systems to address the gap.<sup>93</sup>

### What is current best practice?<sup>94, 95</sup>

How to conduct an audit?	<ul style="list-style-type: none"><li>• Set clear goals and objectives.</li><li>• Choose and develop appropriate indicators that are:<ul style="list-style-type: none"><li>– evidence based</li><li>– relevant</li><li>– valid</li><li>– reliable</li><li>– responsive to change.</li></ul></li><li>• Involve healthcare professionals in the process.</li><li>• Conduct audits regularly.</li></ul>
How to give feedback?	<ul style="list-style-type: none"><li>• Provide feedback multiple times and as soon as possible.</li><li>• Deliver feedback at the health professional level.</li><li>• Focus on specific behaviours.</li><li>• Use multiple modalities, e.g. written reports, verbal feedback, electronic dashboards.</li><li>• Use a combination of visual, graphical, and text-based messages.</li></ul>

	<ul style="list-style-type: none"><li>• Link the visual display and summary message to minimise cognitive load.</li><li>• Use clear comparators that reinforce desired behaviour change.</li><li>• Tailor feedback approaches to reflect situation-specific barriers.</li><li>• Establish and communicate about the credibility of the information.</li><li>• Use champions or colleagues to provide feedback.</li><li>• Guide reflection to minimise defensive reactions.</li><li>• Encourage self-reflection before receiving feedback.</li><li>• Ensure recommendations are specific about an action.</li><li>• Focus on an action that is amenable to change and is under the control of the recipient.</li><li>• Resonate with established goals and priorities.</li></ul>
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