

Same-day surgery for femoral, inguinal and umbilical hernia repair in adults

Final Report

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Executive Summary

Introduction

The Royal Australasian College of Surgeons (RACS) and Medibank Private (Ltd.) recently produced a number of reports on surgical variation in high-volume procedures (RACS and Medibank 2016a). These initial reports examined variation within Medibank's administrative data-set, and based on these results an opportunity has arisen to assess the underlying clinical reasons for observed variations and establish recommendations for good clinical practice. Specifically, the data shows that the majority of patients who undergo hernia repair remain in hospital for one or more nights, whilst it is also known to be conducted as a same-day procedure.

The objective of the present review was to develop an evidence-base that can inform those areas of surgical variation in same-day surgery for hernia repair identified by the Surgical Variance Report, General Surgery (RACS and Medibank 2016b). The focus of this review is to provide guidance on best practice, inform on appropriate patient selection criteria and levers to drive change in practice, based on the best available evidence.

Methods

We utilised the rapid review method, which is an adaptation of a comprehensive systematic literature review technique. This approach ensures that project rigor is maintained while the review is completed in an expedited manner. This format allows the timely identification of best quality evidence at the highest level to answer the research questions (Watt et al. 2008a; Watt et al. 2008b). Studies were prioritised based on study design, recency and their relevancy to key clinical outcomes that inform the research questions. Studies were selected for inclusion based on a step-wise approach across three phases, as outlined in Appendix 1.

A Working Group was arranged to provide feedback and advice. The members were:

- Dr David Rankin (Medibank Clinical Director)
- Dr Stephen Bunker (Medibank Clinical Research Advisor)
- Professor Guy Maddern (Surgical Director RACS Research and Evaluation incorporating ASERNIP-S)
- Mr Alex Karatassas (General Surgeon)
- Professor David Watters (General Surgeon)
- Professor David Fletcher (General Surgeon)
- A/Prof Wendy Babidge (RACS Research, Audit and Academic Surgery Director)

The original project questions were refined and presented in a Protocol that received feedback from the Working Group. Results are provided for each research question, with the risk of bias associated with the identified evidence, literature findings (where available) and expert opinion reported for each.

Results and Conclusions

Same-day surgery for repair of inguinal, femoral and umbilical hernia is safe and effective. However, there are a number of limitations on the evidence used to form this conclusion. The evidence base is stronger for inguinal hernia and includes randomised controlled trials and other comparative

studies, while the evidence for femoral and umbilical hernia is limited to small numbers of observational studies. The studies included were able to provide some observations regarding which patient groups are unsuitable for same-day hernia repair in a clinical setting. Limited evidence suggests these patient groups include those who are elderly (over 70 years), over body mass index (BMI) of 40 (overweight), and those undergoing bilateral surgery. Two studies reported the proportion of patients ineligible for same-day hernia repair, which ranged from 3.3 – 8.0 per cent. Follow-up time across studies was relatively short and may be insufficient to investigate and report long-term adverse events. Overall, a range of guidelines and studies are consistent in the message that a large proportion of hernia repairs can be provided as a same-day procedure.

Australian and international guidelines recommend day surgery for most patients undergoing inguinal hernia repair surgery, providing surgical infrastructure is available to assess and select patients and suitable aftercare is available. The available guidelines were not explicit on day surgery for femoral and umbilical hernia repair. Australian guidelines on the broader issue of same-day surgery, published by the Australian & New Zealand College of Anaesthetists, state that requirements for same-day surgery to be acceptable are based on procedural, patient and social factors.

Clinical practice guidelines and published data from a range of countries are consistent in reporting that an appropriate rate of same-day hernia repair is in the order of 70–80 per cent of all hernia repair surgery. This rate is much greater than in Australian clinical practice, as identified through Medicare administrative data, where in 80 per cent of hospital separations the patient stayed in hospital for at least one night.

Besides the established clinical evidence and widely accepted guidelines, day surgery in general is a multifaceted topic, and many influential factors are external to clinical issues. Hospital management, financial incentives, social factors, facilities and staffing are all important aspects to determine the success of day surgery. While barriers for day surgery exist in all of these aspects, the interaction between patients, healthcare providers and the community remains the greatest one. It is plausible to gain leverage in promoting day surgery by enhancing the patient-doctor communication and education to increase patients' satisfaction, ameliorating staffing and facilities to match resources for day surgery, and creating supportive communities and policies. The acceptance and promotion of day surgery requires a holistic approach from a range of financial, institutional, societal and individual efforts.

A draft of this report was shared with the Working Group for input. Overall comments from the Working Group included the need for appropriate preoperative assessment, the benefits of protocols to guide communication and clinical practice, and the importance of dedicated facilities for same day surgery. There was agreement that most inguinal or umbilical hernia repair procedures can be undertaken in a day surgery setting. Patient preference was also discussed as being an important factor.

In summary, although the clinical benefits of day surgery for hernia repair are well established, there are a number of reasons as to why this activity is less common than expected and this report aims to highlight associated incentives which may be used to promote changes in local practice.

Recommendations

1. Most patients with inguinal or umbilical hernia can be managed as day patients.
2. There are patient satisfaction and financial incentives to maximise day surgery rates without posing risks for suitable patients.
3. The method of hernia repair will not generally affect the decision whether to manage the patient as a day patient or plan for an overnight stay.
4. Good preoperative assessment, planning and informing the patient has the potential to improve same-day surgery discharge rates.
5. Collaboration with the anaesthetists and involvement of anaesthetists in discharge planning is important.
6. The rate of same-day patients to overnight stay patients should be made transparent. The target rate for hospitals should be between 70 to 80% patients as same-day cases.
7. Patients with complex hernias and comorbidities will generally benefit from an overnight stay, or at least be considered for such.
8. The development of Australian and New Zealand guidelines or protocols should be considered, especially in the context of communication and planning to minimise barriers to same-day hernia repair.

Background

Introduction

Variation in the provision of services across surgical practice is often necessary as a result of patient needs, surgeon preference, available resources and jurisdictional requirements. However, in certain circumstances variation may be as a result of a range of different issues, which may be unrelated to clinical aspects and which may lead to increased risk for the patient and the service provider.

Guidelines established by the Australian & New Zealand College of Anaesthetists (2010; 2016) provide general recommendations on same-day surgery in Australia. They state these broader issues include patient selection and anaesthesia factors, procedural considerations, and recovery and discharge arrangements, as well as adequacy of facility resources.

The Royal Australasian College of Surgeons (RACS) and Medibank Private (Ltd.) recently produced a number of reports into surgical variation for high-volume procedures (RACS and Medibank 2016a). These initial reports examined variation within Medibank's administrative data-set, and based on these results an opportunity has arisen to assess the underlying clinical reasons for observed variations and establish recommendations for good clinical practice. In 80 per cent of the hospital separations reported in the data set the patients stayed in hospital for at least one night. The length of stay ranged from same day discharge to up to 10 nights, with one night being the median across all states in Australia. This variation in length of stay has also been observed in many other countries where the origin of the variation has been suggested to be related to the preoperative assessment of patients (Stomberg et al. 2013).

This report has been compiled to develop an evidence-base that can inform those areas of surgical variation in same-day surgery for hernia repair identified by the Surgical Variance Report, General Surgery (RACS and Medibank 2016b). Evidence from published literature is required to **demonstrate** and **promote best practice**. The focus of this report is to provide guidance on best practice, inform on appropriate patient selection criteria and levers to drive practice change, based on the best available evidence.

Project scope

The original project questions were refined and presented in a Protocol that received feedback from the Working Group.

Research questions

1. What is the safety and effectiveness of same-day surgery for inguinal, femoral and umbilical hernia repair compared to surgery with at least one night stay in-hospital?
2. What length of hospital stay does evidence-based Australian or International clinical practice guidelines (CPGs) recommend for surgical treatment of inguinal, femoral and umbilical hernia repair?
3. Are any patient groups not suitable for same-day inguinal, femoral or umbilical hernia repair?
4. What proportion of patients undergoing hernia repair are expected to be ineligible for same-day surgery?

5. Are there any broader criteria for same-day procedures to be performed in Australia that are not specific to hernia repairs?
6. What other factors are reported in the literature (peer-reviewed and grey literature) and/or by clinical experts that impact on the decision to perform same-day surgery?

The report is structured by research question; with the risk of bias associated with the identified evidence, literature findings (where available) and expert opinion reported for each.

PICO criteria

Population, Intervention, Comparator and Outcomes (PICO) were defined as following:

- Population: Adult patients undergoing surgery for inguinal, femoral and umbilical hernia of any type or complexity
- Intervention: planned same-day procedure involving surgery of any type (open or laparoscopic, with or without mesh)
- Comparator: planned ≥ 1 overnight stay following surgery
- Outcomes: adverse events, readmission to hospital, hernia recurrence, cost and resource use (e.g. hospital or hotel resources), medical management (e.g. use of analgesia, use of anti-emetics), issues of equity (e.g. distance of patient from hospital)

Note: Same day surgery is defined as admission and discharge within the same calendar day. Admission and discharge within a 23 hour period, including an overnight stay, is not considered same-day surgery for the purposes of this review.

Further detailed methods are provided in Appendix 1.

Established knowledge

In addition to length of hospital stay, literature was identified relating to a number of other variables surrounding surgery for hernia repair. A systematic review by Treadwell et al. (2012) gives a comprehensive review of hernia repair with a comparison across a large range of techniques. The results for each comparison are summarised below:

- **Repair vs watchful waiting for pain-free hernia**

Two randomised controlled trials (RCTs) met the inclusion criteria which were considered to have moderate risk of bias for all outcomes reported. One RCT was a North American multi-centre study which was funded by a manufacturer of mesh plugs (Fitzgibbons 2006), and the second was a United Kingdom single-centre RCT which did not report source of funding (O'Dwyer 2006). Both studies compared watchful waiting to Lichtenstein repair. All patients had clinically apparent hernia.

Considered outcomes were long-term quality of life, long-term pain, and acute hernia/strangulation. There was sufficient comparative evidence to derive a conclusion on one outcome only, quality of life, which at six months and one year was greater for patients who had received mesh repair than for those who were on watchful waiting. No indication was given as to which patients might specifically benefit from watchful waiting.

The European Hernia Group guidelines advise watchful waiting is a safe and acceptable option in patients with minimally symptomatic hernias and should be considered in elderly patients or patients with major comorbidities (Miserez et al. 2014).

- **Open mesh vs laparoscopic repair with mesh for primary hernia**

Of 38 non-randomised comparative studies which met the inclusion criteria, all but two (which were registry studies) were considered to have moderate risk of bias. Comparisons included transabdominal preperitoneal (TAPP) repair vs Lichtenstein repair (14 studies), totally extraperitoneal (TEP) repair vs Lichtenstein repair (14 studies), TAPP repair vs mesh plug (3 studies), TEP repair vs mesh plug (3 studies), and TAPP repair/TEP repair vs Lichtenstein repair (4 studies).

There was sufficient evidence to derive the following conclusions. Laparoscopy was favoured for time to return to work, time to return to daily activities, lower rates of long-term pain, haematoma and wound infection. Open surgery was favoured for hernia recurrence and epigastric vessel injury. There was approximate equivalence for length of stay.

- **Open mesh vs laparoscopic repair with mesh for bilateral hernia**

Six studies met the inclusion criteria, all but one (which was a registry study of level IV evidence) were considered to have moderate risk of bias.

The evidence was adequate to allow a conclusion on one outcome, return to work, with bilateral hernia patients returning to work sooner if they underwent laparoscopic repair.

- **Open mesh vs laparoscopic repair with mesh for recurrent hernia**

Eight non-randomised comparative studies met the inclusion criteria, all but two (which were registry studies) were considered to have moderate risk of bias. Procedures were Lichtenstein repair (including TAPP and TEP repair) and the Stoppa procedure.

Laparoscopic repair was associated with lower rates of recurrence, faster return to daily activities, and lower rates of long-term pain.

- **Different types of open mesh repair**

Nineteen non-randomised comparative studies met the inclusion criteria, most studies were considered to have a moderate risk of bias. Comparisons included Lichtenstein repair vs mesh plug (7 studies), Lichtenstein repair vs Prolene Hernia System (5 studies), Lichtenstein repair vs open preperitoneal mesh (3 studies), mesh plug vs Prolene Hernia System (2 studies), and Lichtenstein repair versus Kugel® patch (2 studies).

For Lichtenstein repair vs mesh plug technique, recurrence rates were similar, but Lichtenstein repair yielded better results for return to work and rates of seroma. For Lichtenstein repair vs Prolene Hernia System and Lichtenstein repair vs open preperitoneal mesh, outcomes for short-term pain were similar. For mesh plug vs Prolene Hernia System, outcomes for short-term pain were similar. For Lichtenstein repair vs Kugel mesh, outcomes were similar for both short-term pain and intermediate-term pain.

- **Different types of laparoscopic mesh repair**

Eleven non-randomised comparative studies met the inclusion criteria, most of which were considered to have a moderate risk of bias.

For the studies that compared TAPP repair versus TEP repair, TAPP resulted in quicker return to work. Data on short-term, intermediate-term, and long-term pain suggested equivalence.

- **Different mesh materials**

Of the 32 non-randomised comparative studies which met the inclusion criteria, most were considered to have a moderate risk of bias. Comparisons included standard polypropylene vs low-weight polypropylene (6 studies), standard polypropylene vs combination materials (12 studies), standard polypropylene vs coated polypropylene (6 studies), standard polypropylene vs three-dimensional Prolene Hernia System (2 studies), standard polypropylene vs porcine (2 studies), combination materials vs porcine (1 study), and low-weight polypropylene vs combination materials (3 studies).

Standard polypropylene mesh and combination materials had similar rates of recurrence. Three types of mesh (standard polypropylene, low-weight polypropylene, and porcine) had approximately equivalent rates of long-term pain.

- **Mesh fixation approaches**

Twenty-three non-randomised comparative studies met the inclusion criteria, most studies were considered to have a moderate risk of bias. Comparisons included tacks or staples vs no fixation (7

studies), fibrin glue vs staples (3 studies), sutures vs tacks (3 studies), sutures vs glue (7 studies), and absorbable sutures vs nonabsorbable sutures (3 study).

Approximate equivalence was found in recurrence rates for tacks or staples vs no fixation and sutures vs glue. Also, for long-term pain, approximate equivalence was found between sutures and glue, but less pain was associated with fibrin glue than staple fixation.

Results

The evidence base for this review is broad and includes a range of publications from systematic reviews, comparative studies, observational studies, evidence-based clinical practice guidelines, together with grey literature and opinion pieces. A PRISMA chart of study selection is shown in Appendix 3. Specific definitions of day surgery were unclear or varied between studies. The literature available is discussed in more detail in the response to each question.

Question 1: What is the safety and effectiveness of same-day surgery for inguinal, femoral and umbilical hernia repair compared to surgery with at least one night stay in hospital?

Identification of literature

Results were sourced from studies with the highest level of evidence on each hernia type. Following phase 2 study selection (full text review), a total of 47 studies were available which were relevant to question 1 (see Appendix 2). From this evidence base five studies (a systematic review and 4 case series) were included for extraction and review. The 41 remaining studies were of lower level evidence which are subject to high levels of bias and did not add to the available higher level evidence. The majority of these lower level evidence studies were included in a systematic review which was one of the five studies included for extraction and review.

The systematic review included all inguinal hernia repair patients (Fischer and Zechmeister-Koss 2014). Further studies were included to ascertain the safety and effectiveness of same-day surgery for femoral and umbilical hernia repair. One case series included a proportion of patients with femoral hernia together with the majority having inguinal hernia (Voorbrood et al. 2015). Three studies included patients with umbilical hernia (Kulacoglu et al. 2012; Kurzer et al. 2004; Menon and Brown 2003). One case series included a proportion of patients with femoral hernia together with the majority having inguinal hernia (Voorbrood et al. 2015). Three studies included patients with umbilical hernia (Kulacoglu et al. 2012; Kurzer et al. 2004; Menon and Brown 2003) (Table 15). A list of studies presenting outcomes relevant to question 1 are provided in Table 1.

As outlined in detail in the Established Knowledge section, Treadwell's (2007) systematic review on different types of hernia surgery, which did not differentiate by hernia type, concluded open and laparoscopic repair were found to have approximate equivalence for length of stay.

GRADE of the evidence-base

Table 1 provides a summary of findings for selected outcomes that were reported for question 1.

Table 1 GRADE of the evidence base for question 1

Outcomes	Assessment	№ of participants (studies)	Quality of the evidence (GRADE)
Recurrence	Recurrence was recorded in same-day hernia repair patients.	4 (4 observational studies)	⊕⊕○○ LOW ^{ab}

Outcomes	Assessment	No of participants (studies)	Quality of the evidence (GRADE)
Unexpected prolonged stay	Unexpected prolonged stay was recorded in same-day hernia repair patients.	3 (3 observational studies)	⊕⊕○○ LOW ^{a,b}
Complications	Complications were recorded in same-day hernia repair patients.	5 (5 observational studies)	⊕⊕○○ LOW ^{a,b}

a. High risk of bias according to Downs and Black tool (Downs and Black 1998), b. ⊕⊕○○ **Low quality:** Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.

Results: inguinal hernia repair

A systematic review by Fischer and Zechmeister-Koss (2014) addressed the safety and effectiveness of same-day surgery for femoral and inguinal hernia repair. It included three non-randomised controlled trials and two case series on inguinal hernia repair. Follow-up ranged from 3–48 months. The five other studies included to inform on the safety and effectiveness of inguinal hernia repair included one RCT, two non-randomised comparative studies and two case series including a total of 2260 patients. The systematic review identified no studies on femoral hernia repair suitable for inclusion. On the basis of the six included studies the authors concluded that inguinal hernia repair can be done safely and effectively in both day surgery and as an inpatient providing the patient fulfils the general eligibility criteria for day surgery. Satisfaction was reported in the included RCT. There was no significant difference in quality of life as measured with the RAND-36-Item Health Survey between the day case and the inpatient groups. General eligibility criteria for day surgery were not explained, although it was assumed that each hospital or healthcare system will have their own policy on this.

Subsequent to the systematic review Meyer et al. (2015) published a case series of 30 patients with inguinal hernia in France/Brazil, Lingaiah et al. (2015) published a case series of 50 patients with inguinal hernia in India, and Voorbrood et al. (2015) published a case series of 336 patients, 330 of whom had inguinal hernia, in the Netherlands. The studies found that same-day hernia repair is feasible with low rates of complications and, in Voorbrood et al. (2015) on a scale of 0–10 (where 10 was extremely satisfied), patient satisfaction was 9.0 (8.89–9.17 95 % CI).

Results: femoral hernia repair

Only one case series, in which six patients out of 336 had femoral hernia, was available on femoral hernia repair (Voorbrood et al. 2015). All consecutive patients had an appointment for same-day hernia repair in one high volume hospital in the Netherlands and 96.3% of patients had same-day surgery as planned. Of the day surgery, no conversion to open surgery was required and complications were minimal. Nine patients required admission for one night due to complications; one for 10 nights due to an unforeseen complication, and, owing to late scheduled surgery, one patient remained in hospital overnight. Outcomes were not presented for hernia type. In general, it was concluded that same-day surgery for hernia is feasible and satisfactory from an institutional perspective, as well as from a patient perspective.

Results: umbilical hernia repair

Umbilical hernia patients were studied in two retrospective and one prospective case series (Kulacoglu et al. 2012; Kurzer et al. 2004; Menon and Brown 2003), including 185 umbilical repair patients in total. Kulacoglu et al. (2012) concluded that repair of umbilical hernia as day surgery with local anaesthesia is a good option, with low infection and recurrence rates. The mean discharge time after the completion of surgery was 122 ± 58 min (45–420 min). No patient was converted to general anaesthesia. Doses of local anaesthetic agents needed were higher than those for inguinal hernia repair. Higher anaesthetic doses may be required for patients with higher BMI, recurrent hernia, and defects larger than three centimetres. Patient satisfaction rate was 97%, measured as the absence of pain (VAS) and post-operative nausea and vomiting. Being provided with detailed information about the surgery and the anaesthetic improved patient satisfaction.

Kurzer et al. (2004) and Menon & Brown (2003) studied 73 and 32 umbilical hernia repair patients, respectively, and concluded that same day surgery can be accomplished. A high degree of patient satisfaction was claimed in Kurzer et al. (2004), with no measure reported.

Summary

Same-day surgery for repair of inguinal, femoral and umbilical hernia is safe and effective. No study reported low patient satisfaction after same-day hernia repair. However, there are a number of limitations on the evidence used to form this conclusion. The evidence base is stronger for inguinal hernia. The low numbers of published studies, small population sizes and lack of comprehensive reporting with femoral and umbilical hernia repair provide a potential for bias. None of the studies, including those on inguinal hernia, reported on complex hernia repair.

Follow-up time across studies was relatively short, and may be insufficient to investigate and report long-term adverse events (such as small bowel obstruction).

Table 2 Outcomes relevant to question 1

Study ID	Publication Type	Participant characteristics	Same-day discharge rate	Comment
Fischer & Zechmeister-Koss (2014)	Systematic review of hernia repair with a mixture of level of evidence	35 studies	NR	Same-day surgery is safe and effective in 11 procedures, including inguinal hernia repair
Lingaiah et al. (2015)	Case series; retrospective; hospital records	N=40 NR	31%	No mortalities. Day care surgery is effective with low complications.
Meyer et al. (2015)	Case series; prospective; consecutive patients	N=50 NR	100%	Same-day surgery is safe and effective and should be considered for all patients
Voorbrood et al. (2015)	Case series; prospective; consecutive patients	N=336 ASA I or II Unilateral	97%	Same-day inguinal hernia repair is safe and effective, both from an institutional and patient perspective
Kulacoglu et al. (2012)	Case series; retrospective; consecutive patients	N=100 paraumbilical	100%	Same day umbilical hernia repair is safe and effective with low infection and recurrence rates
Kurzer et al. (2004)	Case series; prospective	N=73 ASA I or II	NR	Open repair with mesh is suitable for umbilical hernia and lends itself to same-day surgery with local anaesthetic in the majority of patients
Menon & Brown (2003)	Case series; retrospective	N=32 Uncomplicated	100%	Same-day umbilical hernia repair is safe and effective

ASA: American Society of Anesthesiologists status; NR: not reported.

Question 2: What length of hospital stay does evidence-based Australian or international clinical practice guidelines recommend for surgical treatment of inguinal, femoral or umbilical hernia repair?

Identification of literature

Two searches were conducted to identify clinical practice guidelines (CPGs) providing recommendations on length of hospital stay following inguinal, femoral or umbilical hernia repair. The first search was conducted in PubMed and Embase databases to identify guidelines published in the peer-reviewed literature. The second search involved keyword searching of relevant websites to identify any guideline not identified in the database search. The methods are described in Appendix 1.

Nine clinical practice guidelines, published between 2006 and 2016 were identified from database and grey literature searching. A summary of the guidelines and their recommendations regarding length of hospital stay for hernia surgery is summarised in Table 16 (Appendix 5). The evidence base underpinning the recommendations is described in Table 17 (Appendix 5).

Quality of the evidence-base

The CPGs were appraised using the AGREE II tool by one researcher and checked by a second (Brouwers et al. 2010) (Appendix 1). The CPG by the European Hernia Society (Miserez et al. 2014; Simons et al. 2009) was rated as 'Good' quality, the other CPGs were rated as being of 'Acceptable' quality. All the recommendations in the guidelines were informed by systematic searches of the literature as well as by expert consensus.

Results: inguinal hernia repair

Six guidelines (two of which had recent updates) provided recommendations on length of hospital stay for inguinal hernia repair (Bittner et al. 2011; Bittner et al. 2015; Lomanto et al. 2015; Miserez et al. 2014; Rosenberg et al. 2011; Sanders et al. 2013; Simons et al. 2009; The HerniaSurge Group 2016).

The CPG developed by the HerniaSurge group provided the most recent and comprehensive recommendations on length of stay for inguinal hernias. The guideline Steering Committee and Working Group included members from every continent including an Australasian Hernia Society representative; surgeons who performed (and researched) all types of hernia repair were included. The guideline is intended to cover the management of all adult groin hernia patients worldwide. A literature search was conducted up to 1 January 2015 for systematic reviews and up to 1 July 2016 for RCTs. Evidence was scored using the Oxford, SIGN and GRADE methodologies (Appendix 5). Statements and Recommendations were developed and graded during consensus meetings. "Recommend" was used where strong evidence was available; "Suggest" was used where weak evidence was available.

The HerniaSurge group recommends day surgery for the majority of groin hernia patients provided adequate aftercare is organised. This recommendation is consistent with evidence-based guidelines produced by the European Hernia Society (Miserez et al. 2014; Simons et al. 2009), the British Hernia Society (Sanders et al. 2013) and the Danish Hernia Database (Rosenberg et al. 2011). Guidelines

developed for the Asia region (Lomanto et al. 2015) recommend day surgery should be considered for American Society of Anesthesiologists (ASA) I and II patients following anaesthesia assessment.

The HerniaSurge group also included suggestions for length of stay for specific population groups. Day surgery (providing adequate aftercare is available) was suggested for:

- All endoscopic repairs of simple inguinal hernias
- Selected older patients (including octogenarians but excluding nonogenerians)
- ASA IIIa patients undergoing open repair with local anaesthesia
- Patients undergoing complex inguinal hernia care only in selected cases (these should generally not be performed as day surgery)

The only conflict between these suggestions and the other identified guidelines is that the Asian guidelines recommend all patients ASA \geq III, where surgery is performed under local or general anaesthesia, should be admitted for an overnight stay.

Results: femoral hernia repair

No guideline making recommendations on length of stay following femoral hernia surgery was identified.

Guidelines by the HerniaSurge group (2016) the British Hernia Society and the Danish Hernia Database (Rosenberg et al. 2011) included guidance on femoral hernias; however, recommendations on length of stay and the evidence supporting them are specific to inguinal hernia repair.

Results: umbilical hernia repair

One guideline, reported in two publications, on ventral hernia repair was identified (Bittner et al. 2014a; Bittner et al. 2014b). The guideline did not provide any recommendation on the appropriateness of day surgery; however it did recommend that hospital stay be as short as possible and that based on the shorter hospital stay, laparoscopic repair is recommended.

Summary

Day surgery is recommended for most patients undergoing inguinal hernia repair provided surgical infrastructure is available to assess and select patients and suitable aftercare is available.

Elements which were suitable for or supported same-day surgery were:

- ASA I and II patients following anaesthesia assessment (grade of recommendation: strong)
- Endoscopic repairs of simple inguinal hernias (weak)
- Selected elderly patients (including octogenarians but excluding nonogenerians) (weak)
- ASA IIIa patients undergoing open repair with local anaesthesia (weak)

Elements where a day procedure was generally unsuitable were:

- Patients undergoing complex inguinal hernia care (weak)
- Elderly patients (age not defined but includes all nonogenerians) (weak)
- All ASA IV and some ASA III patients (weak)
- Co-morbidity (weak)
- Patients on anticoagulants due to higher risk of bleeding complications (moderate evidence)

For femoral and umbilical hernia, no guidance on the appropriateness of day surgery was identified.
For umbilical hernia repair, hospital stays are recommended to be as short as possible.

Question 3: Are any patient groups not suitable for same-day inguinal, femoral or umbilical hernia repair?

Identification of literature

Results were sourced from studies with the highest level of evidence including patients with each hernia type of interest. Following phase 2 study selection (full text review), a total of sixteen studies were available which were relevant to question 3 (see Appendix 2). From this evidence base, four studies were included for extraction and review. The 12 remaining studies were of lower level evidence which are subject to high levels of bias and did not add to the available higher level evidence.

The four included studies were non-randomised comparative studies concerning different patient groups. These studies report on patients in all three hernia groups. Patient types included those from metropolitan and regional locations, obese, elderly, those of African-American race, and having bilateral or complex surgery (Table 18; Appendix 6). The World Guidelines for Groin Hernia Management was used to form the response on inguinal hernia repair. Table 4 provides outcomes relevant to question 3.

GRADE of the evidence-base

Table 3 provides a summary of findings for selected outcomes that were reported for question 3.

Table 3 GRADE of the evidence base for question 3

Outcomes	Assessment	No of participants (studies)	Quality of the evidence (GRADE)
Same day discharge	Safety and effectiveness of same-day hernia pair was assessed in different patient groups including elderly vs younger, overweight vs slim, regional vs metropolitan.	2 (2 observational studies)	⊕○○○ VERY LOW ^{a,b}
Unexpected prolonged stay		2 (2 observational studies)	⊕○○○ VERY LOW ^{a,b}
Unexpected readmission		1 (1 observational study)	⊕○○○ VERY LOW ^{a,b}
Emergency readmission		2 (2 observational studies)	⊕○○○ VERY LOW ^{a,b}

a. High risk of bias according to Downs and Black tool (Downs and Black 1998), b. ⊕○○○ **Very low quality:** We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.

Results: inguinal hernia repair

Memtsoudis et al. (2005) conducted a large retrospective case series on same-day inguinal hernia repair patients. Unexpected prolonged stay was experienced in 7.6 per cent of the patient cohort; independent risk factors were found to be increasing age, bilateral procedure, and African-American race. It was discussed that there may be higher admission rates in patients with social insurance, and

the authors proposed that race and insurance status both influence medical treatment. Patients of African-American race and with social insurance are more likely to access medical care through emergency room and therefore are likely to require longer stay. Sinha et al. (2007) undertook a retrospective analysis on administrative and clinical data on elderly patients with inguinal hernia, comparing the results from same-day and non-same-day patients between patients aged 70 years and above, and 65 years and below. Postoperative symptoms included fever, drowsiness, dizziness, pain, bleeding, nausea, and vomiting, which were not significantly different between groups. Prolonged stay was reported in 12.5 per cent of the elderly group and 9.5 per cent of the younger group ($P=0.43$). It was concluded that same-day hernia repair can be successful in patients ≥ 70 years of age.

The World Guidelines for Groin Hernia Management by The HerniaSurge Group (2016) recommends that, while most inguinal hernias are suitable for same-day surgery, complex cases should not be performed as day surgery. The guideline identifies complex cases to include:

- groin hernias with signs of incarceration, strangulation, infection, relevant preoperative chronic pain, difficult local findings in the groin;
- groin hernias in patients with relevant comorbidities;
- difficult intraoperative findings;
- symptoms and signs of postoperative local complications and/or general complications.

Results: femoral hernia repair

A prospective Australian study by Collopy et al. (1991) reported on length of stay in patients located in regional and metropolitan areas with femoral and inguinal hernia, although the proportion of patients with each hernia type was not given. Postoperative complications were observed in 22 per cent of patients in the metropolitan hospital and 16.6 per cent of patients in the regional hospital ($p>0.05$). There was no significant difference in patient age and type of hernia between the metropolitan and regional hospital. However, there was a trend toward later surgically-advised discharge in the metropolitan hospital. The difference between advised length of stay and actual length of stay was 4.4 days in the metropolitan hospital and 2.1 days in the regional hospital, yet the time between surgery and actual discharge was the same between hospitals. The reasons behind this difference are unclear. This may be based on the beliefs of the operating surgeon or on local practice.

Results: umbilical hernia repair

Acevedo & Leon (2010) undertook a prospective analysis on obese ($BMI>30$) and non-obese ($BMI<30$) patients with umbilical (29%) and general groin (24%), and other hernia. The outcomes of pain during surgery and infection at 30 days postsurgery were significantly higher in the obese group ($P<0.004$ and $P<0.023$, respectively). Although readmissions were slightly higher in the non-obese group, this did not reach significance. It was concluded that obesity ($BMI>40$) is not a contraindication for same-day hernia repair under local anaesthetic in a specialised centre. However patients with a $BMI \geq 40$ will need general anaesthetic and may need to be admitted for a longer stay. It is important to note that while surgery can be undertaken on obese patients, the long-term outcomes may be poorer.

Summary

No studies have explicitly undertaken work to investigate specific populations which are indicated for, or should not be considered for, day-case surgery. The studies included were only able to provide observations on which patients were found to be unsuitable in a clinical setting. The limitations of the published evidence-base include the observational (non-randomised) nature of population groups, small populations of patients in different risk factor groups, and non-relevance to the Australian context. Outcomes are largely related to healthcare funding systems in another country.

Table 4 Outcomes relevant to question 3

Study ID	Publication Type	Participant characteristics	Same-day discharge rate	Comment
Memtsoudis et al. (2005)	Case series; retrospective; registry data	N=7853 inguinal hernia	100%	Increasing age, bi-lateral surgery and African-American race lowered likelihood of discharge
Acevedo & Leon (2010)	Case series; prospective	N=2031 I: BMI > 30 C: BMI < 30	100% (unclear)	Obesity with BMI 30-40 is not a risk factor for same-day hernia repair under local anaesthetic
Sinha et al. (2007)	Comparative; consecutive; retrospective	N=588 I: aged ≥ 70 C: aged ≤ 65	I: 87.5% C: 90.5%	Same-day hernia repair can be done on elderly patients aged 70 and above
Collopy et al. (1991)	Comparative; consecutive; prospective; hospital data followed by telephone survey	N=141 I: metropolitan location C: regional location	NR. Difference between the operation date and the surgically advised discharge date 4.4 days metropolitan hospital and 2.1 days in the regional hospital	The time between surgery and actual discharge was the same between metropolitan and regional hospitals

BMI: body mass index; C: comparator; I: intervention; NR: not reported.

Question 4: What proportion of patients undergoing hernia repair are expected to be ineligible for same-day surgery?

Identification of literature

Following phase 2 study selection (full text review), a total of nine studies were identified which were relevant to question 4 (see Appendix 2). Of these studies three contained relevant data. An additional study was included through pearling, resulting in four studies for extraction and review (Table 19; Appendix 7).

The evidence base is made up of a prospective multi-site case series study (Millat et al. 1993), a prospective single centre case series (Voorbrood et al. 2015), a prospective nationwide database (Kehlet and Bay-Nielsen 2008), and a qualitative study based on a survey of doctors (Toftgaard 2007). Hernia type was defined as inguinal in the survey. In the other two studies hernia type was defined as being in the groin region in general or was not defined. Two guidelines were used to inform the evidence for question 4. A list of studies presenting outcomes relevant to question 4 are provided in Table 6.

GRADE of the evidence-base

Table 5 provides a summary of findings for selected outcomes that were reported for question 4.

Table 5 GRADE of the evidence base for question 4

Outcomes	Assessment	№ of participants (studies)	Quality of the evidence (GRADE)
Proportion ineligible for same-day surgery	The proportion of patients who were ineligible for same-day hernia repair was recorded.	2 (2 observational studies)	⊕○○○ VERY LOW ^{a,b}

a. High risk of bias according to Downs and Black tool (Downs and Black 1998), low number of studies, b. ⊕○○○ **Very low quality:** We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.

Results

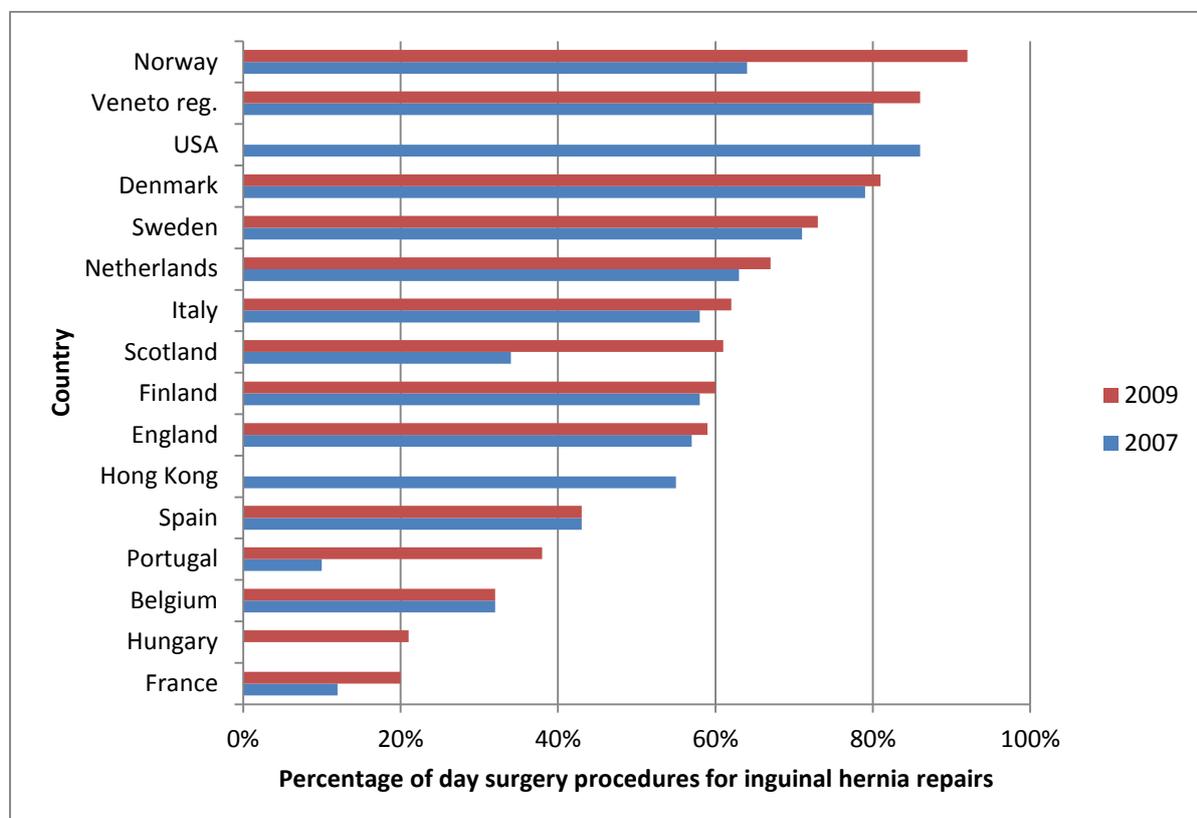
Two included peer-reviewed studies provided the proportion of patients ineligible for same-day hernia repair (Millat et al. 1993; Voorbrood et al. 2015). Across 17 surgical centres in France, a case series study on inguinal hernia repair in 500 consecutive cases identified that 89 (17.8%) were unsuitable for day procedures. Made up of 40 due to medical reasons (8%), 23 for social reasons (4.6%) and 42 due to patient refusal (8.4%). Voorbrood et al. (2015) reported on 336 consecutive patients planning to have hernia repair in a high volume hospital in the Netherlands. Across the cohort, 336 (96.3%) of patients had same-day surgery as planned; of the others, two cancelled their appointment and 11 were rejected for surgery following detailed pre-surgical assessment (3.3%).

In addition to peer-reviewed evidence, two guidelines informed this question. The clinical practice guideline published by the British Hernia Society recommends all patients should be considered for day surgery, with a small number of patients requiring an inpatient stay for comorbidity, social reasons or because of a complex hernia repair (Sanders et al. 2013). The guideline states that if

healthcare providers adhere to this guidance then 70 per cent of hernia repair procedures will be conducted as day procedures.

World guidelines by HerniaSurge suggest day surgery for inguinal hernia repair is becoming increasingly common (The HerniaSurge Group 2016). In Spain in 2005, day surgery inguinal herniorrhaphies constituted 34 per cent of the total. From 2000 to 2010 the rate of inguinal hernia day surgery in the Netherlands increased from 36 per cent to 54 per cent. Data from the Swedish National Registry indicate that 75 per cent of inguinal hernia repairs are performed in day surgery. From 2000 to 2009 the incidence of day surgery for inguinal hernias increased from 62 per cent to 87 per cent in the Northern Italian Veneto region. Further details from these guidelines can be found in the response to research question 2. The most recent analysis of international day surgery rates for inguinal surgery from 2007 and 2009 is shown in Figure 1.

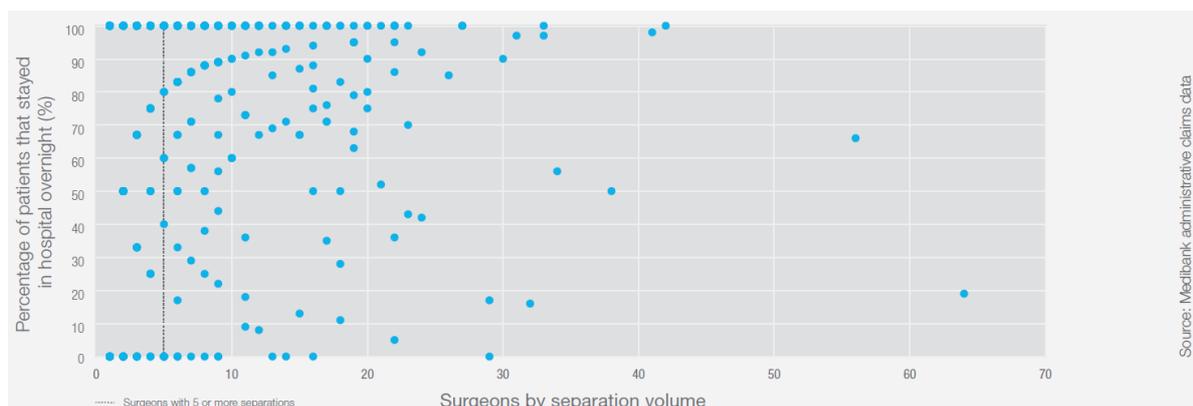
Figure 1 Percentage of day surgery procedures for inguinal hernia repairs in 2007 and 2009 in the Veneto region of Italy and in other countries (Toftgaard 2012)



The database on groin hernias in Denmark identified by pearling further elucidates the rates of same-day hernia repair. Ambulatory surgery for elective hernia repair was observed to have slowly increased over 8 years from 55 per cent in 1998 to 70 per cent in 2005 (Kehlet and Bay-Nielsen 2008). A study with worldwide data reported that in Australia the proportion of hernia repair done as day surgery in 2003 was 22.6 per cent (Toftgaard 2007). Toftgaard (2007) also highlighted there are large differences between countries for day surgery rates.

The surgical variance report also provided Australian data on rates of hernia surgery patients staying overnight by surgeons and their separation volume (Figure 2, RACS and Medibank 2016a). This showed that 80 per cent of hernia repairs funded by Medibank stay overnight and 54 per cent of surgeons kept all of their hernia repair patients overnight, while 6 per cent did not keep any of their patients overnight.

Figure 2 Percentage of hernia surgery patients that stayed in hospital overnight throughout Australia in 2014 (RACS and Medibank 2016b)



Summary

Two studies were able to provide a direct response to the research question. Others were able to indicate the proportion of patients who did undergo day surgery but not those who were found ineligible. The studies have a relatively low sample size and are observational in nature, and the results vary across jurisdictions and over time. However, the studies are consistent in their conclusions that few patients are ineligible for same-day hernia repair with a recent clinical practice guideline stating that 70 per cent of hernia repair procedures can be conducted as day procedures.

Table 6 Outcomes relevant to question 4

Study ID Location	Study design	Patient characteristics	Same-day discharge rate	Proportion ineligible for same-day surgery
Millat et al. (1993)	Case series; prospective (unclear); primary data from 17 sites	N=500 male	82%	17.8%, reasons: medical 8%, social 4.6%, patient refusal 8.4%
Voorbrood et al. (2015)	Case series; prospective; consecutive patients	N=336	97%	3.8%, reasons: no show 0.5%; medical reasons 3.3%
Kehlet et al. (2008)	Case series; prospective; database	87,840 procedures (may include recurrent)	55% in 1998, 70% in 2005	NR
Toftgaard (2003)	Qualitative; retrospective; survey data	Data from 18 countries	22.6%	NR

Question 5: Are there any broader criteria for same-day procedures to be performed in Australia that are not specific to hernia repairs?

Identification of literature

A grey literature search was conducted to identify clinical practice guidelines providing recommendations on same-day surgery in Australia. Two guidelines established by the Australian & New Zealand College of Anaesthetists (ANZCA) were published in 2010 and 2016. In addition, information was identified regarding legislative and accreditation requirements for day surgery (based on a previous report compiled by R&E/ASERNIP-S).

Australian guidelines on day surgery

The Australian & New Zealand College of Anaesthetists has published recommendations which outline the requirements for day surgery (Table 20, Appendix 8). The requirements are grouped into procedure (e.g. rapid return to food and water intake, pain controllable, low risk haemorrhage, low risk airway compromise), patient (willingness, <1 hr travel time, ASA I or II or medically stable II or IV) and social (transport, responsible person to stay overnight, access to telephone). In all cases the ultimate decision for day surgery was deemed to rest with the anaesthetist.

Legislative and accreditation requirements for day surgery

The provision of services in day procedure centres is prescribed by legislation in six jurisdictions (ACT, Qld, Tas, Vic, WA and NSW), where the day procedure services and private hospitals are collectively described as private health facilities. In South Australia and the Northern Territory, the definition of day procedure centres that provide medical and surgical services is unclear. Prescribed surgical procedures in day procedure centres are defined by the level of anaesthesia, or are explicitly listed. The detail and definitions related to this legislation varies from state to state and is currently the subject of review in many jurisdictions.

Due to the requirement of anaesthesia, the service of hernia repair should be provided in a day surgery unit or hospital.

Licensing of facilities is also governed at the state and territory level. In Australia, healthcare facilities are required to be licensed under state legislation prior to operation. Public and private hospitals, day procedure centres and other health service providers are characterised according to local legal definitions. However, each state defines and categorises healthcare facilities differently. A hospital is legislatively distinguished to be a public or a private facility based on whether it is owned by the state government. Distinctions between private hospital and day procedure centres within private settings are not consistent across states.

There is no requirement for day procedure centres to be accredited. However, at the federal level the Private Health Insurance Act (2007)¹ prohibits insurance companies from paying any benefit for treatment in a non-accredited facility. The Act mandates accreditation by an appropriate accreditation body which is defined in the Private Health Insurance (Accreditation) Rules (2011) as a body approved by the Australian Commission on Safety and Quality in Health Care (ACSQHC) to

¹ Private Health Insurance Act 2007 (Cth) ss 121-5(5)-(8)

accredit health care providers against the National Standards.² The Act ensures that any health facility performing procedures which are rebatable by private health insurers must be accredited to the National Safety and Quality Health Service Standards (NSQHS standards) regardless of State legislation.

Due to the availability of insurance and Medicare rebate, the service of hernia repair should be provided in an accredited facility.

Quality of the evidence-base

The quality of the Australian & New Zealand College of Anaesthetists (ANZCA) (2016) guideline on peri-operative care of patients selected for day procedures was appraised with the use of the AGREE II tool (Brouwers et al. 2010) (Appendix 1). The purpose and scope were stated; however, the health questions covered may not have been explicitly described. While target users of the guideline were clearly described, it was unclear if the guideline development included professionals from all groups or if the views of the target audience were sought. The quality of the guideline was diminished by not having a method section where a literature review, or way of ascertaining the knowledge, was reported. It is assumed that, in contrast to most guidelines, this guideline is intended to present the views of the ANZCA on this topic and therefore a rigorous process was not reported. The strength of the guideline was presenting recommendations in a specific and unambiguous manner, with different options for management of health issues clearly stated. The recommendations are easy to identify.

Summary

The Australian & New Zealand College of Anaesthetists has published recommendations which outline the requirements for day surgery. Local regulatory requirements enable same-day procedures in Australia.

² *Private Health Insurance (Accreditation) Rules 2011 rule 2*

Question 6: What other factors are reported in the literature that impact on the decision to perform same-day surgery?

Identification of literature / Sources of evidence

Following phase 2 study selection (full text review), a number of studies were available which were relevant to question 6 (see Appendix 2). Additional information was identified through targeted searches of the peer-reviewed literature and in searches for grey literature.

Each of the included documents was reviewed for any relevant themes relating to the levers and barriers to providing day surgery. Themes, and any supporting information, were extracted into a table (Table 21, Appendix 9). Due to the wide-ranging type (peer-reviewed manuscripts, opinion pieces, editorials, grey literature and so on) and number of publications related to this topic area, resources were extracted until saturation (no new themes were identified in additional resources). In addition, a pragmatic supplementary search was performed in PubMed to broadly capture studies reporting on factors which influence day surgery in any setting. Detailed methods on both approaches are provided in Appendix 1. As such, while every effort was made to identify relevant factors, the reference list used to inform Question 6 should not be seen as all-encompassing, rather as a representative sample. Factors discussed in previous sections of the report (patient factors, anaesthetic requirements) have not been replicated in this section. The combined results of the searches are presented thematically.

Results

A number of levers and barriers for the implementation of day surgery were identified. These encompass community facilities, hospital facilities and staffing, and insurer reimbursement arrangements.

As a result of the wide variety and type of study design that informed this question, a formal quality appraisal and GRADE of the evidence base was not undertaken. The evidence for this question is of a low quality.

A number of themes have been identified to highlight common issues and barriers in performing day surgery.

Barriers to day surgery

It is clear that day surgery can be performed safely and effectively on appropriate patients for less complicated procedures. However, there are still variations in terms of how day procedures are undertaken in real-life practice. Barriers have been identified for day surgery in terms of why a procedure was not performed in a day case but extended with overnight or longer stay. The following potential barriers for day surgery were identified.

Economic

Financial incentives/disincentives could be a barrier to day surgery. For example, private day hospitals in Australia have reported that they are disadvantaged when it comes to contract negotiations with insurers (ADHA 2011). There may be a discrepancy in funding of day hospitals compared to overnight centres for identical procedures (ADHA 2011). There also may be financial incentives to the surgeon or the hospital associated with overnight stays (Barnett 2016).

Reimbursement may be more advantageous to patients if they are kept in overnight (Castoro et al. 2007).

Social factors

A common reason behind a day surgery being extended into an admission with an overnight stay is that there is a lack of social and community support after discharge. Patients may live alone or be unable to receive continuity of care having been discharged. Possible patient support includes:

- Means of transport for travelling back home if needed (Mitchell 2015);
- Relatively short travel distance from hospitals to home (Srivastava et al. 2008), for example a one hour travel time;
- Family and friends being available for the 24 to 48 hours post-discharge to provide care (Srivastava et al. 2008; Weingessel et al. 2008); and
- Patients to provide informed consent (Chung et al. 2005);

In addition, patients should refrain from certain aspects of daily activity once home, such as driving, decision making, caring for dependents and operating machinery. If this support is not available, then day surgery is not feasible (Barnett 2016; Castoro et al. 2007; Quemby and Stocker 2013). These factors are often beyond the control of the patient and become barriers on a societal scale. Therefore, an understanding of the patient circumstances, home location, availability of an appropriate carer and patient adequate education is important to facilitate day surgery.

Facilities

Many practical issues related to the day surgery unit are important for effective provision of day surgery services.

Day surgery should be performed in a dedicated day surgery unit with dedicated administrative support (Kulacoglu et al. 2012; Sandberg et al. 2006). If a separate unit is not feasible, there should be a dedicated nursing team to achieve rapid recovery (Mitchell 2003). The unit needs to be able to remain open long enough that patients at the end of the operating list have sufficient time to recover and to be discharged. If facilities are not set up to optimise day surgery and ease of access this presents a barrier to its implementation (Barnett 2016; Castoro et al. 2007; Quemby and Stocker 2013).

Management and staffing

Day surgery requires a strong multidisciplinary team (Awad and Chung 2006; Suominen et al. 2014). However, often there is a lack of clinical leadership with a specific focus on day surgery and hospital policies and guidelines to cater for it (Awad and Chung 2006; Xirasagar and Lin 2006). The surgical and clinical staff should be supported by a day surgery manager who is in charge of day-to-day running of the unit. The surgeons and anaesthetists who act as champions for same-day surgery should be senior clinicians to promote forward flow and reduce admission rates and complications. The multidisciplinary staffing requirements may be difficult to achieve and therefore represents a potential barrier to day surgery (Barnett 2016; Castoro et al. 2007; Quemby and Stocker 2013).

Communication between patients and carers

Where there is a lack of communication between patients and healthcare providers including surgeons, nurses and other hospital staff, patients and/or healthcare providers may not be aware

that day surgery is an option (Barnett 2016). In addition, patients may often have certain concerns regarding what could happen after discharge, which may seem clinically less important from the surgeon's perspective (Briggs et al. 2009; Hwa and Wren 2013). If surgeons and other healthcare providers are not trained to communicate effectively, this information asymmetry may impact the practicalities and benefits of day surgery, and may therefore create barriers towards more day-procedures being performed (Barnett 2016; Castoro et al. 2007).

Therefore, training and continuing professional development of all staff plays a critical role in the effective adoption of day surgery practices.

Levers for day surgery

Patient satisfaction

High levels of patient satisfaction have been reported for day surgery. This can be optimised by having good postoperative pain control, short waiting times before surgery, providing a friendly environment, avoiding feelings that patients are being rushed or discharged too early and by telephone-based follow-up the day after discharge (Castoro et al. 2007). From patients' perspectives, a high level of understanding of what patients need is vital, not only to whether a day case can be successfully performed, but also of the overall recovery process after discharge (Mitchell 2015). During the a few hours of patient-doctor contact, a keen perception of what information patients would want to have will make a significant difference on patient satisfaction (Quemby and Stocker 2014). With sufficient information and greater certainty, patients are more comfortable to return home on the day of surgery. Therefore, patient satisfaction is a very important lever to day surgery.

As part of patient satisfaction, follow-up is also important. Follow-up phone calls by nurses minimises the burden on primary care, increases patient satisfaction and help early identification of complications (Castoro et al. 2007; Quemby and Stocker 2013). Monitoring and collection of feedback on results of day surgery (from both patients and hospital staff) may also benefit its effective implementation (Castoro et al. 2007).

Patient flow and surgery schedule

Timing of patient admission plays an important role in day surgery decision making. For non-complicated surgery, it is more likely to be conducted as a day case when patients are admitted in the morning (Harries et al. 2013). There will be sufficient time to undergo preoperative assessment and the surgery can be performed early in the day. Patients can be discharged later in the same day and can be followed up in the later evening, the next day or the day after via telephone (Vinoles et al. 2011), or by a visiting nurse. However, patient admission time is affected by many factors.

Comprehensive preoperative assessment

Patient suitability is of vital importance to the success of day surgery. Carefully selecting patients should ensure that day surgery is performed smoothly and efficiently. Adequate preoperative assessment is helpful to increase the efficiency of surgery and avoid unnecessary delay in discharge or cancellation (Harries et al. 2013). However, in day surgery settings, preoperative assessment varied in terms of when it is performed and by whom (Quemby and Stocker 2014; Stomberg et al. 2013). One survey on day hospital staff in Sweden showed that almost 70 per cent of the surgical units schedule their patients for a separate preoperative consultation prior to the day of surgery, and preoperative assessment was commonly undertaken by nurses and anaesthetists. It seemed

that this additional visit could be useful to ensure patients suitability for day case procedures, hence leading to success of the day surgery. However, the author also indicated that such visit might not be necessary to patients who are relatively well (ASA Grade one or two) and scheduled for minor surgery (Gilmartin and Wright 2008; Stomberg et al. 2013).

Economic outcomes

The financial benefits of day surgery are well established. Hospital costs for day surgery are reported as being between 25–68 per cent lower compared to overnight stays. In terms of hospital efficiencies, greater numbers of patients can be treated in a given time period reducing waiting lists so that inpatient facilities are released for more complex or emergency cases. Surgery cancellation due to bed shortages is reduced. Theatres can be used more efficiently. Staffing can be reduced as fewer overnight staff are required (Castoro et al. 2007). To ensure that these economic benefits are achieved the financial incentives for day surgery and overnight stay surgery should be aligned (Castoro et al. 2007). To achieve the full economic benefits of day surgery to the hospital/healthcare system, expansion of day surgery should be accompanied by equivalent reductions in inpatient capacity (Castoro et al. 2007).

Facilities and staffing

The combination of an appropriate facility and adequate staffing can significantly promote day surgery to maximise the efficiency. There should be dedicated day surgery units where patient flows of day surgery and overnight stay patients are separated (Kulacoglu et al. 2012). In addition, providing distinct management structures, and dedicated administration and nursing staff (Castoro et al. 2007) will lead to more timely recovery and discharge (Quemby and Stocker 2014). Specifically, nurse-led discharge, has been promoted in one publication as being more efficient and cost effective (Stomberg et al. 2013). Also, day surgery facilities should take advantage of motivated senior surgeons and anaesthetists as champions to drive change (Castoro et al. 2007).

Patient information and communication

Effective information provision before surgery can prepare patients psychologically for surgery, educate the patient about pre- and postoperative care, minimise risks in the postoperative period, improve patient satisfaction and ensure informed consent is obtained for the procedure (Castoro et al. 2007). As the contact duration in a day case procedure is very limited compared to an in-patient admission, clear instructions in both verbal and written format are important. It is suggested that verbal instructions should be reinforced from an early stage (referral), such as during primary care to discharge (Quemby and Stocker 2014). Written information sheets should also be provided to pre-empt potential hazards during recovery at home. Regular surgical service audits and patient feedback mechanisms are useful to obtain feedback from patients regarding what information they require. A keen insight of what patients are concerned with can give patients greater peace of mind, allowing them to return home with more confidence and less stress.

Regulation

Although regulatory barriers have been noted as being issues in the delivery of same day surgery (Castoro et al. 2007), this is not likely to be a critical issue in the Australian and New Zealand context.

Integration of community support

Primary and community health services play an integral part of day surgery in providing care pre- and postoperatively. Engagement with policy makers, general practitioners, community nurses, family caregivers and social services may improve the available community support.

Summary

The barriers and levers driving the adoption of day surgery practices are more related to logistics and management of patients in hospitals, rather than clinical issues based on published data. In other words, while the benefits of day surgery are understood in terms of clinical safety and effectiveness (see response to question 1), how hospitals, communities, and patients interact remain the biggest factors influencing whether day surgery can be routinely performed. There is a paucity of high quality published evidence in this field, with the majority of published data being surveys, questionnaires and other qualitative studies. No quantitative clinical data is available to answer this question. Large, robust and comprehensive studies are unlikely due to diversity in hospital management, levels of community support and patients' perceptions of day surgery.

Additional input from the Working Group

There was agreement across the Working Group that most inguinal or umbilical hernia repair can be undertaken in a day surgery setting.

In the context of service provision of same-day surgery, including consideration of public and private care, it was thought that practices benefit from access to dedicated day care facilities and established protocols.

Key levers are thought, by the Working Group, to be: appropriate preoperative assessment, coupled with the preparedness of the facility for same day surgery. The most important barrier is thought to be patient information and communication, therefore the process would be facilitated by the development of protocols and guidance for effective patient communication. An engagement strategy for major hospital groups could be beneficial to facilitate hospital and patient preparedness.

At the hospital level, one way to achieve a change in practice is to incorporate performance targets for same-day rates into hospital contracts.

A member of the Working Group highlighted that private patients contribute significantly to their health insurance, and in light of this, suggested surveying the hernia repair patients who stayed overnight after the procedure. This survey would explore the preference of patients for day surgery. It was felt that patient preference is an important factor and survey findings may be an incentive to change practice. Also in line with improving the understanding of local practice, patient information sheets could be reviewed with a view to potentially including some commentary on same day versus overnight hernia procedures.

It was also noted that the development of a position paper or Australian/New Zealand guidelines would be beneficial to advise regarding day surgery in the local context.

The Working Group agrees the initial decision to undertake surgery should include the option of watchful waiting. This must include appropriate patient selection and operating on clinically apparent hernia.

Conclusions

Same-day surgery for repair of inguinal, femoral and umbilical hernia is safe and effective. However, there are a number of limitations on the evidence used to form this conclusion. The evidence base is stronger for inguinal hernia repair and includes RCTs and other comparative studies, while the evidence for femoral and umbilical hernia repair is limited to small numbers of observational studies. The studies included were able to provide some observations regarding which patient groups were found to be unsuitable for same-day hernia repair in a clinical setting. Although few studies had been designed to investigate this question, limited evidence suggests these patient groups include those who are elderly (over 70 years), overweight (BMI over 40), and those undergoing bilateral surgery. Two studies reported the proportion of patients ineligible for same-day hernia repair, including a total of 836 patients, which ranged from 3.3–8 per cent. Overall, a range of guidelines and studies are consistent in the message that a large proportion of hernia repairs (70–80%) can be provided as a same-day procedure.

Australian and international guidelines recommend day surgery for most patients undergoing inguinal surgery, providing that surgical infrastructure is available to assess and select patients and suitable aftercare is available. The available guidelines were not explicit on day surgery for femoral and umbilical hernia repair. Australian guidelines on the broader issue of same-day surgery published by the Australian & New Zealand College of Anaesthetists state that requirements for same-day surgery to be acceptable include procedural, patient and social factors.

Besides the established clinical evidence and widely accepted guidelines, day surgery in general is a multifaceted topic, and many influential factors are external to clinical issues. Hospital management, financial incentives, social factors, facilities and staffing are all important aspects that determine the success of day surgery. While barriers for day surgery exist in all these aspects, the interaction between patients, healthcare providers and the community remains the most significant one. It is plausible to gain leverage in promoting day surgery by enhancing the patient-doctor communication and education to increase patients' satisfaction, ameliorating staffing and facilities to match resources for day surgery, and creating supportive communities and policies. The acceptance and promotion of day surgery requires a holistic approach from a range of financial, institutional, societal and individual efforts.

In summary, although the clinical benefits of day surgery for hernia repair are well established, there are a number of reasons as to why this activity is less common than expected and associated incentives which may be used to promote changes in local practice.

Recommendations

1. Most patients with inguinal or umbilical hernia can be managed as day patients.
2. There are patient satisfaction and financial incentives to maximise day surgery rates without posing risks for suitable patients.
3. The method of hernia repair will not generally affect the decision whether to manage the patient as a day patient or plan for an overnight stay.
4. Good preoperative assessment, planning and informing the patient has the potential to improve same-day surgery discharge rates.

5. Collaboration with the anaesthetists and involvement of anaesthetists in discharge planning is important.
6. The rate of same-day patients to overnight stay patients should be made transparent. The target rate for hospitals should be between 70 to 80% patients as same-day cases.
7. Patients with complex hernias and comorbidities will generally benefit from an overnight stay, or at least be considered for such.
8. The development of Australian and New Zealand guidelines or protocols should be considered, especially in the context of communication and planning to minimise barriers to same-day hernia repair.

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Appendix 1 Methods

Different methodologies were used according to the requirements for each research question. A search of the peer-reviewed literature was used to address questions 1, 3 and 4. A search for clinical practice guidelines was used to address questions 2 and 5. Question 6 was addressed with identified peer-reviewed literature, a grey literature search and targeted searches of peer-reviewed databases. A supplementary search of same-day umbilical hernia repair was conducted to fill any gaps in the original literature search. Outlined here are the methods used for the peer-reviewed literature search, search for clinical practice guidelines, and supplementary searches for question 6 and umbilical hernia. An outline of the appraisal of the evidence, grading of the evidence for each outcome and input for the Working Group follows.

Peer-reviewed literature search

For research questions requiring a systematic literature search the Population, Intervention, Comparator, Outcome (PICO) criteria was defined a priori.

PICO and inclusion criteria

Population, Intervention, Comparator and Outcomes are defined as following:

- Population: Patients (adults) undergoing surgery of any type of repair for (simple/complex) inguinal, femoral and umbilical hernia
- Intervention: planned same-day procedure*
- Comparator: planned ≥ 1 overnight stay following surgery
- Outcomes: adverse events, hernia recurrence, unexpected prolonged stay, unexpected readmission, emergency readmission to hospital, groups ineligible, proportion ineligible

*Note: Same day surgery is defined as admission and discharge within the same calendar day. Admission and discharge within a 23 hour period, including an overnight stay, is not considered same-day surgery for the purposes of this review.

Search strategy

Our approach utilised the rapid review method, which is an adaptation of a comprehensive systematic literature review technique. This approach ensures that the project rigor is maintained while the review is completed in an expedited manner. This format allows the timely identification of best quality evidence at the highest level to answer the research questions. (Watt et al. 2008a; Watt et al. 2008b) Studies were prioritised based on recency and their relevancy to key clinical outcomes that inform the research questions.

The search strategy was designed to encompass alternative spelling of the search terms and the corresponding MeSH (medical subject heading) terms where appropriate.

Searches were conducted in the following databases using the search terms outlined in Table 7:

- PubMed
- Embase
- The Cochrane Library

Table 7 PUBMED search terms

Search strategy	<pre> ((((((length of stay[MeSH Terms] OR length of stay[Title/Abstract]) OR (((same day[Title/Abstract] OR day case[Title/Abstract] OR day-case[Title/Abstract] OR day surger*[Title/Abstract])) OR ((Ambulat*[Title/Abstract] OR outpatient*[Title/Abstract])) OR (((Ambulatory Care[MeSH Terms] OR Ambulatory Surgical Procedures[MeSH Terms] OR outpatients[MeSH Terms]))) AND ((((("Hernia, Inguinal/surgery"[Mesh] OR "Hernia, Femoral/surgery"[Mesh] OR "Hernia, Umbilical/surgery"[Mesh])) OR (((((((inguinal[Title/Abstract] OR femoral[Title/Abstract] OR umbilical[Title/Abstract])) OR (((inguinal[MeSH Terms] OR femoral[MeSH Terms] OR umbilical[MeSH Terms])) AND (((hernia[MeSH Terms] OR ((hernia[Title/Abstract] OR hernia*[Title/Abstract])))) AND (((surgery[MeSH Terms] OR ((surger*[Title/Abstract] OR surgical*[Title/Abstract] OR procedur*[Title/Abstract] OR operati*[Title/Abstract])) OR repair*[Title/Abstract])))) </pre>
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This strategy was adapted for the Embase database with relevant keywords and Emtree terms included.

Inclusion of studies

The review included peer-reviewed studies on adult patients undergoing any surgery for repair of simple or complex inguinal, femoral or umbilical hernias which measured length of stay and reported safety or effectiveness outcomes (Table 8).

Table 8 Inclusion and exclusion criteria

Component	Inclusion/exclusion criteria
Population	Studies on adults undergoing inguinal, femoral and/or umbilical hernia repair. Studies on incisional hernia and hiatal hernia, or on children, were excluded.
Intervention	NA
Comparator	NA
Outcomes	Studies reporting length of stay. Studies reporting safety and effectiveness outcomes. Studies not reporting length of stay or effectiveness outcomes were excluded.
Publication type	Peer-reviewed studies.
Publication date	No date limit was applied to the search.

NA: not applicable.

Studies were selected for inclusion based on a step-wise approach across three phases. For phase 1, citations were downloaded into an Endnote library and screened initially by title and abstract, then by full text, according to the inclusion criteria. Screening was completed by a single researcher and checked by a second researcher. Those included from the full text review were sorted based on the specific question(s) that each study provided data on (Appendix 2). This step is referred to as phase 2. The phase 2 table was used to choose the studies to provide evidence for each question.

For phase 3, identified studies were prioritised using the NHMRC levels of evidence (NHMRC 2009). Level I evidence (systematic reviews of RCTs) were sought to be included. Where there was an absence of level I evidence, level II evidence was included; in the absence of level II evidence, level III evidence was included. Level IV evidence (case series studies without a comparator arm) was only included in this review when there was no evidence of higher quality to address a particular patient group.

Searches for clinical practice guidelines

Two searches were conducted to identify clinical practice guidelines (CPGs) providing recommendations on length of hospital stay following inguinal, femoral or umbilical hernia repair.

The first search was conducted in PubMed and Embase databases to identify guidelines published in the peer-reviewed literature. The search strategy used for the PubMed database is described in Table 9. Keywords and MeSH terms were adapted for the Embase database. No limits were applied to the search. All identified citations were downloaded into an Endnote database and reviewed against the inclusion and exclusion criteria described in Table 10.

Table 9 CPG search strategy for the PubMed database.

Population search terms	(((((inguinal hernia) OR inguinal hernia[MeSH Terms]) OR femoral hernia) OR femoral hernia[MeSH Terms]) OR umbilical hernia) OR umbilical hernia[MeSH Terms]))
Publication-type terms	((((((((((((((((((algorithm) OR CPGs) OR CPG) OR position statement) OR position statements) OR position paper) OR consensus) OR clinical recommendations) OR clinical recommendation) OR clinical standard) OR clinical standards) OR clinical protocols) OR clinical protocol) OR clinical pathways) OR clinical pathway) OR standards) OR standard) OR recommendations) OR recommendation) OR guidelines) OR guideline) OR care standards) OR care standard) OR consensus development[MeSH Terms]) OR health planning guideline[MeSH Terms]) OR planning recommendation, health[MeSH Terms]) OR practice guideline[MeSH Terms]) OR standards of care[MeSH Terms]))
Search strategy	Terms relating to the population were combined with terms relating to publication type with AND

This strategy was adapted for the Embase database with relevant keywords and Emtree terms included.

Table 10 Inclusion and exclusion criteria

Component	Inclusion/exclusion criteria
Population	Guidelines covering inguinal, femoral and/or umbilical hernia treatment. Guidelines on incisional hernia and hiatal hernia were excluded.
Intervention	NA
Comparator	NA
Outcomes	Guidelines making any recommendation or statement on the length of hospital stay associated with surgical repair of hernias. Guidelines that did not comment on length of hospital stay were excluded.
Publication type	A document was considered a guideline if: It contains the word 'guideline' or 'recommendation' in its title or introduction, or contains recommendations on same-day surgery for hernia repair; It was developed by at least two authors; It is based on a systematic identification and review of evidence and limited to study designs of Level III comparative evidence or higher. Any document not considered to be a guideline, including primary studies, literature reviews, letters, editorials and abstracts, was excluded.
Publication date	Any guideline published or reviewed since 2006 was included.

NA: not applicable.

The second search involved keyword searching relevant of websites to identify any guideline not identified in the database search. The websites searched are described in Table 11. All relevant documents were downloaded and reviewed for inclusion against the criteria described in Table 10.

Table 11 Grey-literature search for relevant CPGs

Website	Search terms
http://www.guideline.gov/	Hernia
https://www.nhmrc.gov.au/guidelines-publications	Hernia
http://www.health.gov.au/	Hernia
https://www.evidence.nhs.uk/	Hernia
https://www.cma.ca/En/Pages/clinical-practice-guidelines.aspx	Hernia
http://www.sign.ac.uk/	Hernia
http://www.g-i-n.net/	Hernia
https://www.google.com.au/	Hernia + guideline
http://www.europernherniasociety.eu/	guideline
http://www.britishherniasociety.org/	guideline
http://canadianherniasociety.ca/en/	guideline
http://herniasurge.com/	guideline
http://ssat.com/	guideline

Supplementary searches

Additional targeted searches for peer-reviewed and/or grey literature documents were conducted for question 6 and for umbilical hernia.

Question 6 grey literature search methodology

All grey literature searches were conducted in Google using the following terms:

- Barriers to same day surgery
- Hernia + length of stay factors
- Day surgery + development
- Encouraging day surgery
- Promoting day surgery
- Day surgery + promotion
- Day surgery + increasing
- Day surgery + restrictions
- Ambulatory surgery + barriers
- Ambulatory surgery + promotion
- Drivers of day surgery
- Day surgery + economics
- Day surgery + incentives

Search results were reviewed for relevance and any potentially relevant resources were downloaded or read in full to confirm eligibility.

Question 6 targeted searches in peer-reviewed bibliographic databases

A pragmatic supplementary search was performed in PubMed. Firstly, the existing keyword searches for literature on day surgery (Table 7) were repeated to identify all possible publications. This search was not limited to hernia surgery, but included any type of surgery in a day case setting. Secondly,

titles and abstracts were screened using text words relevant to levers, promotions and incentives of day surgery in the identified literature pool. Within these publications, a small sample of useful studies discussing different aspects of influential factors in day surgery were identified and retrieved for full text review. Finally, articles ‘similar’ (as defined by PubMed) to these useful studies were identified and cross-referenced with the initial literature pool.

Umbilical hernia search methodology

Medline was searched through the Ovid platform. The search strategy is presented in Table 12. From the supplementary search 234 new publications were identified; however, no studies were found that are relevant to the inclusion criteria for this review.

Table 12 Medline search terms

Search strategy	(((((((length of stay) OR length of stay[Title/Abstract])) OR (((same day[Title/Abstract] OR day case[Title/Abstract] OR day-case[Title/Abstract] OR day surger*[Title/Abstract])) OR ((Ambulat*[Title/Abstract] OR outpatient*[Title/Abstract])) OR (((Ambulatory Care) OR Ambulatory Surgical Procedures) OR outpatients))) AND (paraumbilical hernia) OR (ventral hernia) OR (umbilical hernia))) AND (((surgery) OR (((surger*[Title/Abstract] OR surgical*[Title/Abstract] OR procedur*[Title/Abstract] OR operati*[Title/Abstract])))) OR repair*[Title/Abstract]))))
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This strategy was adapted for the Embase database with relevant keywords and Emtree terms included.

Quality appraisal

Prioritised studies were evaluated for quality using established tools:

- AMSTAR for systematic reviews (Shea et al. 2007)
- Modified Downs and Black for RCTs and comparative studies (Downs and Black 1998)
- AGREE II tool for guidelines (Brouwers et al. 2010)

The quality of each included study was appraised by one reviewer and checked by a second reviewer. The quality of the studies helped establish the strength of evidence for each question.

Reporting of the results and GRADE

Due to the rapid review methodology used for this review, no statistical pooling of results was performed for clinical outcomes. Results were reported narratively for each research question.

For each clinical outcome, the GRADE tool was used to assess the quality of the evidence base used to inform the conclusions of the review (Guyatt et al. 2011). The quality of the studies according to the tools above, as well as their inconsistency, indirectness, and imprecision were used to guide the grading of the evidence.

Expert input and Working Group feedback

The Draft Report was circulated to the Working Group for comment. The final report was discussed with the Working Group at a face-to-face meeting on 23 February 2017.

Appendix 2 Extraction tables

Table 13 Phase 2 search results

Study ID	Phase 2, Q	Country	No. patients	Hernia type	Level of evidence	Included in report, Q
de Lange et al. (2010)	1	Netherlands	4354	inguinal	IV	
Devlin et al. (1977)	1	UK	350	inguinal	IV	
Devlin et al. (1986)	1	UK	696	inguinal	IV	
Ferguson & Wardle (2013)	1	UK	103	NA	NA	
Fischer & Zechmeister-Kross (2014)	1	Austria	35 studies	inguinal	SR	1
Herszage et al. (1999)	1	Argentina	1470	inguinal, umbilical	IV	
Holzheimer 2007	1	Germany	300	inguinal	IV	
Hulme-Moir & Kyle (1998)	1	New Zealand	124	inguinal	IV	
Jacquet et al. (2006)	1	France	833	inguinal	IV	
Kallianpur et al. (2007)	1	India	90	inguinal	IV	
Kornhall & Olsson (1976)	1	Sweden	109	inguinal	IV	
Krupinski et al. (1997)	1	Poland	148	inguinal	IV	
Kulacoglu et al. (2012)	1	Turkey	100	umbilical	IV	1
Kurzer et al. (2004)	1	UK	78	umbilical	IV	1
Lafferty et al. (1998)	1	UK	100	inguinal	IV	
Lau & Lee (2000)	1	HK	271	inguinal	IV	
Lau & Patail (2003)	1	HK	31	inguinal	III-2	
Lau 2004	1	HK	114	inguinal	IV	
Lau et al. (2000)	1	HK	157	inguinal	IV	
Lau et al. (2006)	1	HK	289	inguinal	II	
Lee et al. (1984)	1	USA	616	inguinal	IV	
Lingaiah et al. (2015)	1	India	40	inguinal	IV	
Lozanoa et al. (2010)	1	Spain	402	inguinal, umbilical	IV	
Maddern et al. (2004)	1	Australia	86	inguinal	IV	
Majholm et al. (2012)	1	Denmark	57,709	inguinal, umbilical	IV	
Marin et al. (1998)	1	Spain	961	inguinal	IV	
Mattila et al. (2011)	1	Finland	89	inguinal	II	
Mattila et al. (2012)	1	Finland	43	inguinal	IV	
McCloud & Evans (2003)	1	UK	796	unclear	IV	
McFarlane 2000	1	Jamaica	98	inguinal	IV	
McGrath et al. (2004)	1	Canada	152	inguinal	IV	
Menon & Brown (2003)	1	UK	32	umbilical	IV	1
Meyer et al. (2015)	1	France/ Brazil	50	inguinal	IV	
Mokete & Earnshaw (2001)	1	UK	1037	inguinal	IV	
Moreno-Egea et al. (2006)	1	Spain	300	inguinal	IV	
Ngo et al. (2010)	1	France	257	inguinal, umbilical	IV	
Obalum et al. (2008)	1	Nigeria	72	inguinal	IV	
Perez et al. (2000)	1	Spain	145	inguinal	IV	
Putnis et al. (2004)	1	UK	98	inguinal	IV	
Sawney et al. (2010)	1	Canada	98	inguinal	IV	
Treadwell et al. 2012	1	USA	151 studies	inguinal	SR	1
Voorbrood et al. (2015)	1, 4	Netherlands	336	femoral, inguinal, umbilical	IV	1, 4
Acevedo & Leon (2010)	3	Chile	2031	inguinofemoral, umbilical	III-2	3
Akinci et al. (2012)	3	Romania	1170	inguinal	IV	
Amato et al. (2013)	3	Italy	292	inguinal	IV	

Study ID	Phase 2, Q	Country	No. patients	Hernia type	Level of evidence	Included in report, Q
Clark et al. (1996)	3	UK	277	inguinal	IV	
Collopy et al. (1991)	3	Australia	141	inguinal, femoral	III-2	3
Jaffer et al. (2008)	3	UK	50	inguinal	IV	
Jutte et al. (2010)	3	Netherlands	52	inguinal	IV	
Karakaya et al. (2009)	3	Turkey	206	inguinal	IV	
Kurzer et al. (2009)	3	UK	100	inguinal	IV	
Sinha et al. (2007)	3	UK	588	inguinal	III-3	3
Henderson et al. (1989)	4	UK	2582	inguinal	IV	
Menachemi et al. (2007)	4	USA	89,193	inguinal	IV	
Toftgaard (2007)	4	Denmark	795	unclear	IV	4*
Board & Caplan (2000)	6	Australia	320	femoral, inguinal	III-3	
Caplan et al. (1999)	6	Australia	244	inguinofemoral	III-1	
Dhumale et al. (2020)	6	UK	1164	inguinal	IV	
Graham et al. (2012)	6	UK	128	inguinal	IV	
Griffiths et al. (1979)	6	UK	1309	inguinal	IV	
He and Mellor (2013)	6	USA	-	inguinal	IV	
Heikkinen et al. (1998)	6	Finland	40	inguinal	II	
Jacobs & Morrison (2008)	6	USA/ Germany	NA	inguinal	NA	
Joh et al. (2003)	6	South Korea	100	inguinal	IV	
Khajanchee et al. (2004)	6	USA	85	inguinal	NA	
Kreckler et al. (2012)	6	UK	-	inguinal	NA	
Laffaye (1989)	6	USA	43,000	unclear	IV	
Mlangeni et al. (2005)	6	Germany	20,210	inguinal	IV	
Saia et al. (2013)	6	Italy	143,910	femoral, inguinal	IV	
Shetty et al. (2004)	6	UK	427	femoral, inguinal, umbilical	IV	
Goulbourne & Ruckley (1979)	1, 3	UK	870	inguinal	IV	
Minatti et al. (2002)	1, 3	Argentina	304	unclear	III-1	
Mitchell & Harrow (1994)	1, 4, 6	USA	27,036	inguinal	IV	6
Khan & Bhutiani (2008)	1, 6	UK	108	inguinal	IV	
Russell et al. (1977)	1, 6	UK	123	inguinal	II	
Barros et al. (2008)	3, 4	Portugal	586	inguinal	IV	
Memtsoudis et al. (2005)	3, 4	USA	7953	inguinal	III-2	3
Sanjay et al. (2006)	3, 4	UK	577	inguinal	IV	
Millat et al. (1993)	3,4	France	500	inguinal	IV	4
Xirasagar & Lin (2006)	6, 4	USA / China	29,699	femoral, inguinal	III-2	6

Table 14 Extracted elements

Study ID

- Author
- year
- journal
- country
- publication type
- setting
- population size

Surgical parameters

- Hernia surgery type
- Same-day discharge rate
- follow up , type of follow up
- anaesthesia
- techniques

Clinical indications

- unexpected prolonged stay
- unexpected readmission
- recurrence
- complications
- emergency admission

Results on any of the following topics

- general quality of life
- cost and economic analysis
- risk factors

Appendix 3 PRISMA flow charts

A PRISMA flow chart for the formal peer-reviewed search is presented in Figure 3.

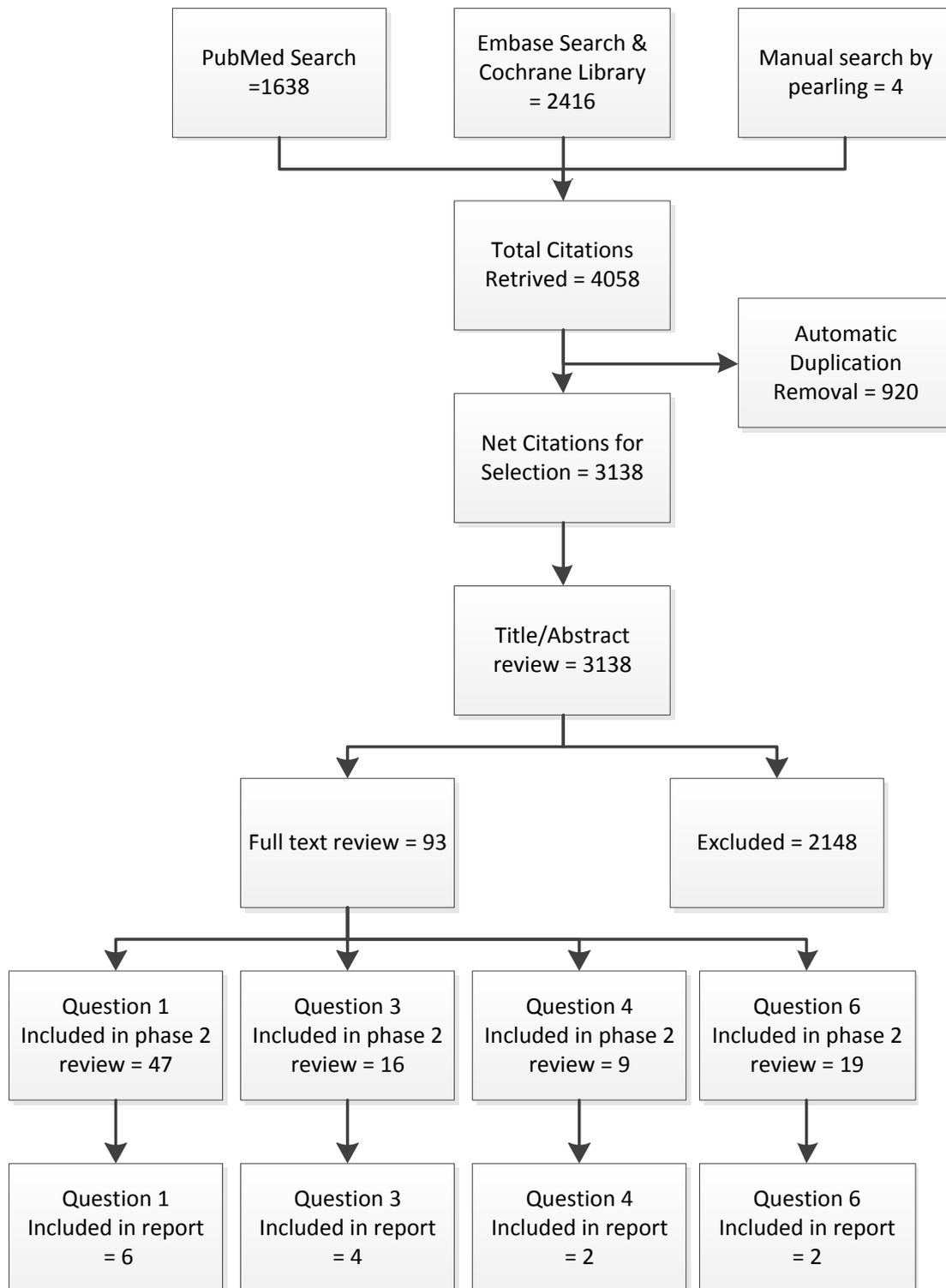


Figure 3 PRISMA flow diagram for the formal peer-reviewed search

Appendix 4 Results from research question 1

Table 15 Results from question 1

Study ID	Study design	Patient characteristics	Hernia surgery type Same-day discharge rate	Complication rate, complications (safety)	Recurrence Unexpected prolonged stay (effectiveness)
Fischer & Zechmeister-Koss (2014)	Systematic review of mixture of studies on hernia repair with a mixed level of evidence	35 studies	Inguinal = 5 studies (the other 30 studies were on other surgery types) NR	Same day 2-33%, inpatients 2-6%; complication type not given	0% (both groups) 2% (inpatients group)
Voorbrood et al. (2015)	Case series; prospective; consecutive patients	N=336 ASA I or II Unilateral	Femoral = 6, other = 346 97%	Intraoperative minor 1.2%; bleeding, coagulation	1.5% 0.3%
Kulacoglu et al. (2012)	Case series; retrospective; consecutive patients	N=100 paraumbilical	Umbilical = 100 100%	11%; SSI, haematoma, seroma, allergy to material, ecchymosis	0% 1%
Kurzer et al. (2004)	Case series; retrospective; consecutive	N=73 ASA I or II	Umbilical = 73 NR	Postoperative pain on the second day mild in 50%, moderate in 23%, wound infections 9%	0% NR
Menon & Brown (2003)	Case series; retrospective; unknown if consecutive	N=32 Uncomplicated	Umbilical = 32 100%	2 wound infection (6%)	0% NR

ASA: American Society of Anesthesiologists status; NR: not reported.

Appendix 5 Results from research question 2

Table 16 Summary of the recommendations from the clinical practice guidelines

Author, year, publisher	Location	Scope	Methods	Recommendations on length of stay	Grade
Lomato et al. (2015)	Asia	Inguinal hernia repair	Literature search (Dates). Consensus meetings.	For ASA I and II patients, hernia repair should generally be performed as a day surgery, although this should be assessed based on the type of Anesthesia. For ASA \geq III patients, if surgery is performed under local or general Anesthesia, an overnight stay should be required.	Grade A – Consistent level 1 studies – Oxford Centre for Evidence Based Medicine
Bittner et al. (2011). Updated 2015 International Endohernia society	International	Laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia	Literature search (dates) Consensus meeting.	None made	NA
Simons et al. (2009). Updated as Miserez et al. (2014) European Hernia Society	Europe	Inguinal hernia treatment in adults	Literature search Consensus meeting	An operation in day surgery should be considered for every patient.	Grade B - consistent level 2 or 3 studies or extrapolations from level 1 studies Oxford Centre for Evidence Based Medicine
Rosenburg et al. (2011). Danish Hernia Database	Denmark	Inguinal and femoral hernia in adults	Review of European Guidelines, review of Danish national database, consensus meetings	Groin hernia repair should primarily be performed in an outpatient setting	NR
Saunders et al. (2013) British Hernia Society	UK	Groin hernias	Literature search and consensus meetings in accordance with the Surgical Speciality Associations and the Royal College of Surgeons of England Commissioning Guidance Process Manual and the AGREE II criteria	All patients should be considered for day case surgery. The pre-assessment process and Surgical infrastructure are important in ensuring appropriate selection and effective day-case services. A small number of individuals require inpatient stay for co-morbidity, social reasons or for complex inguinal hernias. (Grade D (GPP))	(Grade B) (Grade D (GPP))

Author, year, publisher	Location	Scope	Methods	Recommendations on length of stay	Grade
Simons et al. (2016) The HerniaSurge Group	Worldwide	Groin hernia management	Literature search and consensus meetings, vote and external review.	Day surgery is recommended for the majority of groin hernia patients provided adequate aftercare is organized. Day surgery is suggested for all endoscopic repairs of simple inguinal hernias provided adequate aftercare is organized. Day surgery is suggested for selected older and ASA IIIa patients (open repair under local anaesthesia) provided adequate aftercare is organized. Day surgery for patients with complex inguinal hernias is suggested only in selected cases.	Strong Weak Weak Weak
Bittner et al. (2014)	Worldwide	Ventral and incisional hernia. Note only ventral hernia is relevant to this report	Literature search Consensus meeting	The operation time and hospital stay must be as short as possible. Based on the shorter hospital stay, LIVHR is the preferred operative technique Laparoscopic incisional hernia repair can be recommended as a cost-effective repair	Grade A Grade A Grade D

ASA: American Society of Anesthesiologists status; GPP: good practice point; LIVHR: laparoscopic incisional and ventral hernia repair; NA: not applicable; NR: not reported; TAPP: transabdominal preperitoneal; TEPP: totally extraperitoneal; UK: United Kingdom.

Table 17 Evidence base underpinning the recommendations from the CPGs

Author, year, publisher	Summary of evidence	Level of evidence
Lomato et al. (2015)	Hernia repair can mostly be done as an ambulatory surgery except in selected patients.	Level 2A Oxford Centre for Evidence Based Medicine
Bittner et al. (2011). Updated 2015 International Endohernia society	Day-case surgery may be a risk factor for acute pain.	Level 3B Oxford Centre for Evidence Based Medicine

Author, year, publisher	Summary of evidence	Level of evidence
<p>Simons et al. (2009). Updated as Miserez et al. (2014) European Hernia Society</p>	<p>2009 evidence: Inguinal hernia surgery as day surgery is as safe and effective as that in an inpatient setting, and more cost-effective. Inguinal hernia surgery can easily be performed as day surgery, irrespective of the technique used. Selected older and ASA III/IV patients are also eligible for day surgery. 2014 Update: Selected older and ASA III patients are also eligible for day surgery (open repair, local anaesthesia).</p>	<p>Level 2B Level 3 Level 1B</p>
<p>Rosenburg et al. (2011). Danish Hernia Database</p>	<p>Inguinal hernia surgery as day surgery is as safe and effective as inpatient treatment and more cost effective. This applies for all patients including selected elderly and ASA-III-patients, but may depend on local factors such as social backup etc.</p>	<p>NR</p>
<p>Saunders et al. (2013) British Hernia Society</p>	<p>Retrospective studies and small RCTs have shown day surgery is as safe and effective as in-patient stay, and less costly. In two of three studies patients were at least as content with day surgery. Day surgery is associated with lower costs than in-patient procedures. Multiple cohort studies report successful day-procedures under general, regional and local anaesthetics. Tension-free repair under local anaesthetic may be the most suitable procedure for day-surgery; case series data shows other surgical and anaesthetic techniques can be effectively used as day surgery. Initially day surgery had strict selection criteria (for example ASA I–II, age limit, anticipated length of operation less than one hour, low BMI). Such strict criteria are becoming less common and day-surgery can be considered for virtually every patient who has satisfactory home care. Pre-assessment is important to facilitate day surgery.</p>	<p>2++ or extrapolated from 1++ and 1+ studies</p>
<p>Simons et al. (2016) The HerniaSurge Group</p>	<p>The evidence base cited in the European Guidelines was also cited in the World Guidelines. Additional points: Readmission rates following inguinal hernia surgery ranged from 0.8% to 1.1% in two large Danish studies of day procedures. No reports of death or complication directly related to day surgery were identified. Following laparoscopic repair (TAPP/TEP) and posterior open-mesh repair severe bleeding may occur within the first 48 hours. As management of large haematoma is often only possible after immediate diagnosis; short stay treatment can be considered following these procedures.</p>	<p>Moderate evidence (GRADE)</p>

Author, year, publisher	Summary of evidence	Level of evidence
	<p>There is insufficient data to recommend outpatient repair of complex inguinal hernia; however if after care is arranged, some cases may be suitable for ambulatory surgery.</p> <p>Operations on strangulated and acutely incarcerated hernias should not be performed as day cases.</p> <p>Barring the exclusions cited above, IH day surgery can be considered for every patient with satisfactory care at home, including stable ASA III patients</p> <p>Day surgery should also be considered for the elderly, including octogenarians. However, nonagenarians should be excluded since even elective IH repair in those over 90 has a tenfold higher mortality rate compared with younger patients. Day surgery should not be performed on patients taking anticoagulants due to the higher risk of bleeding complications.</p>	
Bittner et al. (2014)	<p>In elderly patients, COPD and low preoperative serum albumin are independent predictors of wound infections; CAD, COPD, low preoperative serum albumin, and steroid use are independent predictors of a longer hospital stay.</p> <p>LIVHR significantly reduces hospital stay compared with open repair.</p> <p>Hospital stays are comparable after suture fixation and tacks fixation.</p> <p>The hospital stay is significantly shorter after LIVHR than after open repair for patients with hernias larger than 15 cm.</p> <p>The hospital stay is shorter after LIVHR for primary ventral hernia than after incisional hernia.</p> <p>The cost of surgery is higher for laparoscopic procedure, but a shorter hospital stay may make laparoscopic surgery more cost effective.</p>	<p>Level 2</p> <p>Level 1a</p> <p>Level 1b</p> <p>Level 2b</p> <p>Level 3</p> <p>Level 1a</p>

ASA: American Society of Anesthesiologists status; BMI: body mass index; CAD: coronary artery disease; COPD: chronic obstructive pulmonary disease; IH: inguinal hernia; LIVHR: laparoscopic incisional and ventral hernia repair; RCT: randomised controlled trial; TAPP: transabdominal preperitoneal; TEPP: totally extraperitoneal.

Excluded clinical practice guidelines

The following guidelines were identified as relevant to hernia repair but did not include any recommendation on length of hospital stay:

Alfieri, S, Amid, PK, Campanelli, G, Izard, G, Kehlet, H, Wijsmuller, AR, Di Miceli, D & Doglietto, GB 2011, 'International guidelines for prevention and management of post-operative chronic pain following inguinal hernia surgery', *Hernia*, vol.15, pp. 239-49.

Heidelbaugh, JJ, Llanes, M & Weadock, WJ 2010, 'An algorithm for the treatment of chronic testicular pain', *Journal of Family Practice*, vol.59, pp. 330-36.

John, MECfCD & Communications, S. 2007, AHRQ Comparative Effectiveness Reviews, Surgical Management of Inguinal Hernia, Comparative Effectiveness Review Summary Guides for Clinicians, Agency for Healthcare Research and Quality (US),

Lange, JFM, Kaufmann, R, Wijsmuller, AR, Pierie, JPEN, Ploeg, RJ, Chen, DC & Amid, PK 2013, 'The 2012 international consensus algorithm for management of chronic postoperative inguinal pain', *European Surgical Research*, vol.50, pp. 32-33.

Lange, JFM, Kaufmann, R, Wijsmuller, AR, Pierie, JPEN, Ploeg, RJ, Chen, DC & Amid, PK 2015, 'An international consensus algorithm for management of chronic postoperative inguinal pain', *Hernia*, vol.19, pp. 33-43.

Poelman, MM, van den Heuvel, B, Deelder, JD, Abis, GS, Beudeker, N, Bittner, RR, Campanelli, G, van Dam, D, Dwars, BJ, Eker, HH, Fingerhut, A, Khatkov, I, Koeckerling, F, Kukleta, JF, Miserez, M, Montgomery, A, Munoz Brands, RM, Morales Conde, S, Muysoms, FE, Soltes, M, Tromp, W, Yavuz, Y & Bonjer, HJ 2013, 'EAES Consensus Development Conference on endoscopic repair of groin hernias', *Surg Endosc*, vol.27, pp. 3505-19.

Remer, EM, Casalino, DD, Arellano, RS, Bishoff, JT, Coursey, CA, Dighe, M, Fulgham, P, Israel, GM, Lazarus, E, Leyendecker, JR, Majd, M, Nikolaidis, P, Papanicolaou, N, Prasad, S, Ramchandani, P, Sheth, S, Vikram, R & Karmazyn, B 2012, 'ACR appropriateness criteria acute onset of scrotal pain - Without trauma, without antecedent mass', *Ultrasound Quarterly*, vol.28, pp. 47-51.

Sheen, AJ, Stephenson, BM, Lloyd, DM, Robinson, P, Fevre, D, Paajanen, H, de Beaux, A, Kingsnorth, A, Gilmore, OJ, Bennett, D, Maclennan, I, O'Dwyer, P, Sanders, D & Kurzer, M 2014, 'Treatment of the sportsman's groin': British Hernia Society's 2014 position statement based on the Manchester Consensus Conference', *Br J Sports Med*, vol.48, pp. 1079-87.

Society for Surgery of the Alimentary Tract 2007, 'SSAT patient care guidelines. Surgical repair of groin hernias', *J Gastrointest Surg*, vol.11, pp. 1228-30.

Treadwell, J, Tipton, K, Oyesanmi, O, Sun, F & Schoelles, K. 2012, AHRQ Comparative Effectiveness Reviews, Surgical Options for Inguinal Hernia: Comparative Effectiveness Review, Agency for Healthcare Research and Quality (US)

Appendix 6 Results from research question 3

Table 18 Results from question 3

Study ID	Study design	Patient groups studied	Same day discharge	Unexpected prolonged stay	Unexpected readmission	Emergency readmission
Memtsoudis et al. (2005)	Case series; retrospective; non-consecutive; registry data	In this cohort race, elderly, and complex surgery were risk factors	100%	7.6%	NR	NR
Acevedo & Leon (2010)	Case series; prospective; non-consecutive; registry data	Obese (BMI > 35) Slim (BMI < 35)	NR	NR	NR	Obese 0.9% Slim 1.3% (NS)
Sinha et al. (2007)	Non-randomised; comparative; retrospective consecutive	Elderly (>70 years) Younger (<65 years)	Elderly 87.5% Younger 90.5%	Elderly 12.5% Younger 9.5% ($p=0.43$)	Elderly 12.7% Younger 9.5% ($p=0.43$)	Elderly 3.9% Younger 5.5% ^a
Collopy et al. (1991)	Non-randomised; comparative; prospective; consecutive; hospital data followed by telephone survey	Regional and metropolitan patients	NR	NR	NR	NR

BMI: body mass index; NR: not reported; NS: not significant. ^a patients who needed medical assistance, none of these experienced hospital admission.

Appendix 7 Results from research question 4

Table 19 Results from question 4

Study ID	Publication Type	Patient characteristics	Same-day discharge rate	Proportion ineligible for same-day surgery	Comment
Millat et al. (1993)	Case series; prospective (unclear); consecutive patients; primary data from 17 sites	N=500 male	82%	17.8%, reasons: medical 8%, social 4.6%, patient refusal 8.4%	Being employed, having low physical requirements, being younger, and having fewer than two medical risk factors were associated with successful short-stay surgery, however as not randomised these may not be independent variables
Voorbrood et al. (2015)	Case series; prospective; consecutive patients	N=336	97%	3.8%, reasons: no show 0.5%; medical reasons 3.3%	Ineligibility resulted from erroneous diagnosis (7), asymptomatic and switched to watchful waiting (3), different hernia type requiring a different procedure (1)
Kehlet et al. (2008)	Case series; prospective; database	87,840 procedures (may include recurrent)	55% in 1998, 70% in 2005	NR	Establishment of a compulsory nation-wide database improves patient outcomes
Toftgaard (2007)	Qualitative; retrospective; survey data	Data from 18 countries	In 2003 in Australia hernia repair done as day surgery = 22.6%	NR	There is great variation in day surgery activity between countries

NR: not reported.

Appendix 8 Results from research question 5

Table 20 Extraction of relevant clinical practice guidelines for question 5

Resource ID	Title	Main themes relevant to criteria for same-day procedures to be performed in Australia
Australian and New Zealand College of Anaesthetists (2016)	Guidelines for the perioperative care of patients selected for day stay procedures	<p>Patient selection and anaesthesia factors: Should be of physical status ASA II or medically stable ASA III or IV patients Medical comorbidities assessment should be undertaken, with particular attention to difficult airways or sleep disordered breathing A BMI threshold should be established, above which the patient will be scheduled for early consultation with an anaesthetist While infants and children are suitable, they need to have specific arrangements for their treatment made</p> <p>Procedural considerations: The procedures should: Have minimal post-operative haemorrhage Have minimal risk of post-operative airway compromise Have a level of post-operative pain that can be controlled by outpatient management techniques Permit post-operative care to be managed by the patient or carer with any nursing requirements met by day surgery, home or district nursing facilities Be associated with a rapid return to normal food and fluid intake Be scheduled accounting for recovery period. For example, where a prolonged recovery is expected the procedure should be scheduled high on the list</p> <p>Recovery and discharge arrangements: The post anaesthesia care unit should be separated into 1st stage recovery and 2nd stage recovery. Patients should not leave recovery unaccompanied. The following criteria should be satisfied before a patient can be discharged home: vital signs are stable for at least one hour in a conscious state with orientation as to time, place, and relevant people mobility level is similar to pre-anaesthesia levels, allowing for surgery type pain control is adequate nausea, vomiting and dizziness are manageable is tolerating oral fluids bleeding is minimal for those at risk of urinary retention, must have passed urine written and verbal instructions for post-anaesthesia and surgical care must have been provided to patient or carer, including advice on any regular medicine where needed, and a contact place and telephone number for</p>

Resource ID	Title	Main themes relevant to criteria for same-day procedures to be performed in Australia
		<p>emergency care must have received convalescence advice analgesia has been provided when necessary a responsible adult must be available to transport the patient and stay with them overnight if inpatient transfer, the anaesthetist/surgeon will be responsible for the patient until care is transferred to another medical officer</p> <p>Adequacy of facility resources: Facilities should be licensed or meet equivalent standards Facilities should have appropriately qualified staff, an adequate number of staff, and appropriate equipment Adverse event management and reporting, infection control and drug handling consistent with national standards Ambulance access to air transfer of inpatients, and the discharge area should be convenient Facility should be reasonable close to the patient's home Must have an established system for audit of anaesthesia care outcomes</p>
Australian and New Zealand College of Anaesthetists (2010)	Recommendations for perioperative care of patients selected for day care surgery	<p>Patient requirements: A willingness to have the procedure performed, an understanding of the process, and ability to follow discharge instructions Social requirements: A responsible adult should be able to transport the patient home, stay overnight and understand after the requirements of post-anaesthesia care The patient must be residing within one hour of medical attention on the first night The patient should have ready access to a telephone in their residence</p> <p>Patient preparation: Refer to document <i>PS7 Recommendations on the Pre-Anaesthesia Consultation</i> for all patients who are to receive anaesthesia Refer to document <i>PS26 Guidelines on Consent for Anaesthesia or sedation</i> for preparation for day surgery All day cases must be scheduled with appropriate time for pre-operative anaesthetic assessment Patient assessment can be assisted by: a standard patient questionnaire, prior referral by the surgeon, preliminary nurse assessment, anaesthesia consultation prior to the day of surgery by the anaesthetist who will be present</p> <p>The patient should be provided with information including: information on the procedures to be followed in the day surgery unit instructions for fasting</p>

Resource ID	Title	Main themes relevant to criteria for same-day procedures to be performed in Australia
		<p>Sedation and anaesthesia: General, regional or local anaesthesia, sedation or a combination of these techniques may be used ANZCA Professional Standards documents should be satisfied where appropriate</p> <p>Recovery from anaesthesia: Refer to document <i>PS4 Recommendations for the Post-Anaesthesia Recovery Room</i> which is fully applicable to day surgery units Area should have comfortable reclining seats, be adequately supervised, with access to resuscitation equipment, and patients may not leave this area unaccompanied</p> <p>Discharge from day care unit: The criteria applying to patients being discharged home as in the 2016 guideline Discharge authorised by an appropriate staff member after discharge criteria satisfied Whenever possible a telephone enquiry as to the patient's wellbeing should be made on the following day</p> <p>Audit: Each day surgery unit must have an established system for audit of the outcomes and include those outcomes in quality assurance and peer review processes</p>

ASA: American Society of Anesthesiologists status; BMI: body mass index; ANZCA: Australian and New Zealand College of Anaesthetists.

Appendix 9 Results from research question 6

Table 21 Extraction of relevant resources (excludes studies identified through supplementary searches)

Resource ID Country	Intended use	Main themes relevant to levers and barriers of day surgery
Caroden (2010) and Caroden et al. (2009)	PhD thesis investigating optimum theatre scheduling in a day-case environment	Scheduling: Describes the research around OR scheduling and how to optimise this in a day-care environment.
ADHA (2011)	Australian Day Hospital Association comments to the ACCC re: private health insurance	Economic barriers: Private Day Hospitals are disadvantaged in contract negotiations with insurers. There may be discrepancy in funding compared to overnight centres for identical procedures.
Quemby et al (2013)	Peer-reviewed journal article	Social factors: If 24 hour home care, access to a telephone, accommodation within 1 hour of the hospital and/or patients informed consent are not present then day surgery should not occur. Facilities: The National Day Surgery Task Force set up by the UK government in 1993 recommended that every hospital should have a dedicated day surgery unit. Dedicated day surgery lists in autonomous units provide the best model of care and avoid tension from competing interests of mixed in-patient and day-care lists. Many units fail to achieve this; however, good outcomes have been demonstrated in some units which share theatres with inpatient activity but have dedicated day surgery postoperative facilities. Management and staffing: Each day surgery unit should have a medical clinical lead, unit nurse manager, and administration support. Nurse-led discharge is the key to day-surgery. Follow-up: Nurse-led follow-up by telephone provides a valuable resource for minimising burden on primary care, increasing patient satisfaction and identifying any complications.
Barnett (2016)	Review	Social Factors: Patient must understand procedure and consent to day surgery. Patients must be within 1 hour of a medical facility, have access to a telephone, refrain from driving, operating machinery or decision making, should have appropriate care and not need to care for dependents. Management and staffing: Day surgery units should have a clinical lead with a specific interest in day surgery to develop policies and guidelines. They should be supported by a day surgery manager who is in charge of day-to-day running of the unit. Surgeons and anaesthetists should be senior clinicians to promote forward flow and reduce admission rates and complications. Staff should be multi-skilled. Facilities: Day surgery should occur in a self-contained unit with good transport options nearby.

Resource ID Country	Intended use	Main themes relevant to levers and barriers of day surgery
		<p>If a separate unit is not feasible there should be a separate nursing team to achieve rapid recovery. The unit should remain open late enough that patients at the end of the operating list have sufficient time to recover.</p> <p>Economic: There may be financial incentives to the surgeon or hospital associated with inpatient stays</p> <p>Educational: Medical students and doctors may not be trained in the benefits of day surgery and therefore be unwilling to drive change.</p> <p>Lack of home support: There may be a lack of adequate community support.</p> <p>Information: Patients and healthcare providers may not be aware of day surgery as an option.</p> <p>Organisational: Day surgery requires strong multidisciplinary team working and this may be difficult to achieve.</p>
Castoro (2007)	WHO policy document on day surgery	<p>Patient satisfaction: High levels of patient satisfaction with day surgery have been reported. This can be optimised by – good postoperative pain control, short waiting times before surgery, courtesy of staff and a friendly environment, avoidance of feeling that they are being rushed or discharged too early, follow-up telephone on the day following discharge.</p> <p>Economic outcomes: The financial benefits are well established – hospital costs are between 25–68% lower. More patients can be treated in the same amount of time reducing waiting lists, inpatient facilities are released for more complex or emergency cases. Surgery cancellation due to bed shortages is reduced. Theatres can be used more efficiently. Staffing can be reduced as fewer overnight staff is required.</p> <p>Management and staffing: The most effective organisational structure is the creation of a distinct day-surgery service led by an experienced manager. A multidisciplinary approach is required. The day-surgery unit should have its own administrative infrastructure to manage patient flows.</p> <p>Nursing requires a multi-skilled approach.</p> <p>Community support: Integration between hospitals and community support (including GPs, policy makers, community nurses, family caregivers and social services) is required for day-surgery to be effective as pre- and postoperative care is performed in the community.</p> <p>Information: Effective information is required to prepare the patient psychologically for surgery, educate the patient about pre- and postoperative care, minimise risks in the postoperative period, improve patient satisfaction and obtain informed consent for the surgery.</p> <p>Regulatory: There may be regulatory barriers to day surgery</p> <p>Economic: Reimbursement may be more advantageous if patients are kept in overnight. Patients may be required to pay more out of pocket for day surgery as opposed to having full coverage for overnight stays.</p> <p>Educational: A lack of education about day surgery may reduce medical students' and doctors' awareness of day surgery.</p>

Resource ID Country	Intended use	Main themes relevant to levers and barriers of day surgery
		<p>Facility design: Health facilities may not be configured to facilitate day surgery. This may be in terms of internal configuration (ease of patients flow) and external configuration (ease of access).</p> <p>Lack of community support: This may be a barrier to day surgery</p> <p>Organisational: Weak multidisciplinary teamwork can be a barrier to day surgery.</p> <p>Recommendations: Consider day surgery, rather than inpatient surgery, the norm for all elective procedures Separate flows of day-surgery patients from inpatients Design day-surgery facilities according to local needs, structurally separate from inpatient facilities whenever possible Provide day-surgery units with independent management structures and dedicated nursing staff Take advantage of motivated surgeons and anaesthetists to lead the change Achieve economies by ensuring that expansion of day surgery facilities is accompanied by reductions in inpatient capacity Invest in educational programmes for hospital and community staff Remove regulatory and economic barriers Align incentives Monitor and provide feedback on results (including patients' views)</p>

ACCC: Australian Competition and Consumer Commission; OR: odds ratio; WHO: World Health Organization.

Appendix 10 Working Group and Researchers

Working Group

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- Dr Stephen Bunker (Medibank Clinical Research Advisor)
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- Mr Alex Karatassas (General Surgeon)
- Professor David Watters (General Surgeon)
- Professor David Fletcher (General Surgeon)
- A/Prof Wendy Babidge (RACS Research, Audit and Academic Surgery Director)

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