World Guidelines for Groin Hernia Management

The HerniaSurge Group

Key Questions, Statements and Recommendations

(Key Statements for the Consensus vote in yellow)

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Abstract

Introduction

Worldwide, more than 20 million patients undergo groin hernia repair annually. The many different approaches, treatment indications and a significant array of techniques for groin hernia repair warrant guidelines to standardize care, minimize complications, and improve results.

The main goal of these guidelines is to improve patient outcomes, specifically to decrease recurrence rates and reduce chronic pain, the most frequent problems following groin hernia repair.

Methods

An expert group of international surgeons (the HerniaSurge Group) and one anesthesiologist pain expert was formed. The group consisted of members from all continents with specific experience in hernia-related research. Care was taken to include surgeons who perform all different types of repair and had preferably performed research on groin hernia surgery. During the Group’s first meeting, Evidence-Based Medicine (EBM) training occurred and 166 key questions (KQ) were formulated. EBM rules were followed in complete literature searches (including a complete search by The Dutch Cochrane database) to January 1, 2015 and to July 1, 2015 for level 1 publications.

The articles were scored by teams of two or three according to Oxford, Sign and Grade methodologies. During five two-day meetings, results were discussed with the working group members leading to 125 statements and 86 recommendations. Statements graded as “strong” lead to recommendations. Those graded as “weak” lead to suggestions. In the Results and Summary section below, the term “should” refers to a recommendation.

Finally, consensus was sought by putting 50 "KEY" statements and recommendations to a vote by all HerniaSurge members. The AGREE II instrument was used to validate the guidelines. An external review was performed by three international experts.

Results and Summary

Inguinal hernia (IH) risk factors include: family history, previous contra-lateral hernia, gender, age, abnormal collagen metabolism, prostatectomy, and low body mass index. Perioperative risk factors for recurrence like: poor surgical technique, low surgical volume, and surgical inexperience should be considered when treating IH patients.

IH diagnosis can be confirmed by physical examination alone in the vast majority of patients with appropriate signs and symptoms. Rarely, ultrasound is necessary. Less commonly still, an MRI, CT scan or herniography may be needed.
The EHS classification system is suggested to stratify IH patients for tailored treatment, research and audit. Symptomatic groin hernias should be treated surgically. Asymptomatic or minimally symptomatic male IH patients may be managed with “watchful waiting” since their risk of hernia-related emergencies is low. The majority of these individuals will eventually require surgery; therefore, surgical risks and the watchful waiting strategy should be discussed with patients. Surgical treatment should be tailored to the surgeon’s expertise, patient- and hernia-related characteristics and local/national resources.

Mesh repair is recommended as first choice, either by an open procedure or a laparo-endoscopic repair technique. One standard repair technique for all groin hernias does not exist. It is recommended that surgeons/surgical services provide both anterior and posterior approach options. HerniaSurge suggests Lichtenstein or laparo-endoscopic repair as optimal techniques. Provided that resources and expertise are available, laparoscopic techniques have faster recovery times, lower chronic pain risk and are cost effective. There is discussion concerning laparo-endoscopic management of potential bilateral hernias (occult hernia issue). After patient consent, during TAPP, the contra-lateral side can be inspected. This is not suggested during unilateral TEP repair.

Day surgery is recommended for simple groin hernia repair provided aftercare is organized and suggested for selected other cases (e.g. after local anesthetic in ASA IIIa patients).

Surgeons should be aware of the intrinsic characteristics of the meshes they use. Use of so-called low-weight mesh may have short-term benefits like reduced postoperative pain and shorter convalescence, but are not associated with better longer-term outcomes like recurrence and chronic pain. Mesh selection on weight alone is not recommended. Migration and/or erosion incidence seems higher with plug versus flat mesh. It is suggested not to use plug repair techniques. In almost all cases, mesh fixation in TEP is unnecessary. In both TEP and TAPP it is recommended to fix mesh in M3 hernias (large medial) to reduce recurrence risk.

Antibiotic prophylaxis in average-risk patients in low-risk environments is not recommended. In laparo-endoscopic repair it is never recommended.

Local anesthesia in open repair has many advantages and its use is suggested (especially in patients with severe systemic disease) provided the surgeon is experienced in this technique. General anesthesia is suggested over regional as it allows for faster discharge with fewer complications like urinary retention, myocardial infarction, pneumonia and thromboembolism. Perioperative field blocks are recommended in all cases of open repair.

An early return to normal activities can be safely recommended.

Provided expertise is available, it is suggested that women with groin hernias undergo laparo-endoscopic repair in order to decrease chronic pain risk and avoid missing a femoral hernia. Watchful waiting is suggested in pregnant women as groin swelling most often consists of self-limited round ligament varicosities. Timely mesh repair by a laparo-endoscopic approach is suggested for femoral hernias provided expertise is available.
All complications of groin hernia management are discussed in an extensive chapter on the topic (chapter 18). Chronic postoperative inguinal pain (CPIP) is a serious complication affecting 10-12% of IH repair patients. It is defined as bothersome moderate pain impacting daily activities lasting at least 3 months postoperatively. CPIP risk factors include: young age, female gender, high preoperative pain, early high postoperative pain, recurrent hernia and open repair. Chapter 19 covers CPIP prevention and treatment. In short, the focus should be on nerve recognition in open surgery and, in selected cases, prophylactic pragmatic nerve resection (Planned resection is not suggested.). It is suggested that CPIP management be performed by multi-disciplinary teams. It is also suggested that CPIP be managed by a combination of pharmacological and interventional measures and, if this is unsuccessful, followed by, in selected cases, (triple) neurectomy and (in selected cases) mesh removal.

For recurrent hernia after anterior repair, posterior repair is recommended. If recurrence occurs after a posterior repair, an anterior repair is recommended. After a failed anterior and posterior approach, management by a hernia specialist surgeon is recommended.

Risk factors for hernia incarceration/strangulation include: female gender, femoral hernia presence and a history of hospitalization related to groin hernia. It is suggested that treatment of emergencies be tailored according to patient- and hernia-related factors, local expertise and resources.

Learning curves vary between different techniques. Probably about 100 supervised laparo-endoscopic repairs are needed to achieve the same results as open mesh surgery like Lichtenstein. It is suggested that case load per surgeon is more important than center volume. It is recommended that minimum requirements be developed to certify individuals as expert hernia surgeon. The same is true for the designation “Hernia Center.”

From a cost-effectiveness perspective, day-case laparoscopic IH repair with minimal use of disposables is recommended.

The development and implementation of national groin hernia registries in every country (or region, in the case of small country populations) is suggested. They should include patient follow-up data and account for local healthcare structures.

A dissemination and implementation plan of the guidelines will be developed by global (HerniaSurge), regional (international societies) and local (national chapters) initiatives through internet websites, social media and smartphone Apps. An overarching plan to improve access to safe IH surgery in low resource settings (LRSs) is needed. It is suggested that this plan contains simple guidelines and a sustainability strategy allowing implementation and maintainability, independent of international aid. It is suggested that in LRSs the focus be on performing high-volume Lichtenstein repair under local anesthesia using low-cost mesh.

Three chapters (29, 30, and 31) discuss future research, guidelines for general practitioners and guidelines for patients.
Conclusions

The HerniaSurge Group has developed these extensive and inclusive guidelines for the management of adult groin hernia patients. It is hoped that they will lead to better outcomes for groin hernia patients wherever they live! More knowledge, better training, national audit and specialization in groin hernia management will standardize care for these patients, lead to more effective and efficient healthcare and provide direction for future research.
Chapters

PART 1

Management of Inguinal Hernias in Adults

1. General introduction
2. Risk factors for the development of inguinal hernias in adults
3. Diagnostic testing modalities
4. Groin hernia classification
5. Indications – treatment options for symptomatic and asymptomatic patients
6. Surgical treatment of inguinal hernias
7. Individualization of treatment options
8. Occult hernias and bilateral repair
9. Day surgery
10. Meshes
11. Mesh fixation
12. Antibiotic prophylaxis
13. Anesthesia
14. Postoperative pain – prevention and management
15. Convalescence

PART 2

Specific Aspects of Groin Hernia Management

16. Groin hernias in women
17. Femoral hernia management
18. Complications – prevention and treatment
19. Pain – prevention and treatment
20. Recurrent inguinal hernias
21. Emergency groin hernia treatment

PART 3

Quality, Research and Global Management

Quality Aspects

22. Expertise and training
23. Specialized centers and hernia specialists
24. Costs
25. Registries
26. Outcomes and quality assessment
27. Dissemination and implementation

Global Groin Hernia Management
28. Inguinal hernia surgery in low resource settings

Research, General Practitioner and Patient Perspectives

29. Questions for research
30. Summary for general practitioners
31. Management of groin hernias from patients’ perspectives
PART 1
Management of Inguinal Hernias in Adults

Chapter 1  HerniaSurge: The World Guidelines for Groin Hernia Management

no statements

Chapter 2  Risk Factors for the Development of Inguinal Hernias in Adults

KQ02.a What are the risk factors for the development of primary inguinal hernias in adults?

KQ02.b What are the acquired, demographic and perioperative risk factors for recurrence after treatment of IH in adults?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Important intrinsic risk factors for the development of primary inguinal hernias include: inheritance, a previous contralateral hernia, gender, age and abnormal collagen metabolism.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
<td>Important acquired risk factors for the development of primary inguinal hernias are prostatectomy and low body mass index.</td>
</tr>
<tr>
<td>Statement</td>
<td>Future studies on primary inguinal hernia formation should consider these inborn and acquired risk factors.</td>
</tr>
<tr>
<td>Statement</td>
<td>Several important intrinsic/demographic (anatomy, female gender, abnormal collagen metabolism), acquired (obesity), and perioperative risk factors (poor surgical technique, low surgical volume, surgical inexperience, and local anesthesia) for IH development exist.</td>
</tr>
</tbody>
</table>

Recommendation Intrinsic, acquired, surgical and perioperative risk factors are recommended to be strongly considered since they are potentially modifiable and can influence the type of repair performed.

Chapter 3  Diagnostic Testing Modalities

KQ03.a Which diagnostic modality is the most suitable for diagnosing groin hernias?

KQ03.b Which diagnostic modality is the most suitable for diagnosing patients with obscure pain or doubtful swelling?

KQ03.c Which diagnostic modality is the most suitable for diagnosing recurrent groin hernias?
**KQ03.d** Which diagnostic modality is the most suitable for diagnosing chronic pain after groin hernia surgery?

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Clinical examination (CE) alone is recommended for confirming the diagnosis of an evident groin hernia.</th>
<th>☒ ☐ ☐ Strong *upgraded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendation</td>
<td>CE and US combined is recommended as most suitable for diagnosing patients with vague groin swelling or possible occult groin hernias. Dynamic MRI or CT can be considered for further evaluation if US is negative or non-diagnostic.</td>
<td>☒ ☒ ☐ Strong *Upgraded</td>
</tr>
<tr>
<td>Recommendation</td>
<td>CE and US combined is suggested as most suitable for confirming the diagnosis of recurrent groin hernia. Dynamic MRI or CT can be considered for further evaluation if US is negative or non-diagnostic.</td>
<td>☒ ☒ ☐ Weak</td>
</tr>
<tr>
<td>Recommendation</td>
<td>The use of US-guided nerve blocks is suggested as most suitable for diagnosing the cause of chronic pain after inguinal hernia surgery. US, CT or MRI scans are helpful in identifying non-neuropathic causes of chronic groin pain (i.e. mesh-related pathologies, recurrent hernias, neuromas – occasionally).</td>
<td>☒ ☒ ☐ Weak</td>
</tr>
</tbody>
</table>

**Chapter 4 Groin hernia classification**

**KQ04.a** Is a groin hernia classification system necessary, and if so, which classification system is most appropriate?

| Recommendation | Use of the EHS classification system for inguinal hernias is suggested for the purposes of performing research, tailoring treatments and performing quality audits. | ☒ ☒ ☐ Weak |

**Chapter 5 Indications - Treatment Options for Symptomatic and Asymptomatic Patients**

**KQ05.a** Is a management strategy of watchful waiting safe for men with **symptomatic** inguinal hernias?

**KQ05.b** What is the risk of a hernia complication (strangulation or bowel obstruction) in this population?

**KQ05.c** Is a management strategy of watchful waiting safe for men with **asymptomatic** inguinal hernias?
**KQ05.d** What is the risk of a hernia complication (strangulation or bowel obstruction) in this population?

**KQ05.e** Are emergent inguinal herniorrhaphies associated with higher morbidity and mortality?

**KQ05.f** What is the crossover rate from watchful waiting to surgery?

<table>
<thead>
<tr>
<th>Statement</th>
<th>There is a low complication risk (incarceration or strangulation) in asymptomatic or <strong>minimally symptomatic</strong> men with inguinal hernias.</th>
<th>☐ ☑ ☑ ☑ ☑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
<td>Emergent repair of incarcerated or strangulated inguinal hernias in men is associated with higher morbidity and mortality compared with elective repair in men with <strong>symptomatic</strong> inguinal hernias.</td>
<td>☒ ☒ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Statement</td>
<td>The crossover rate to surgery in men with <strong>minimal symptomatic</strong> inguinal hernias is high due to the development to symptoms, mostly pain.</td>
<td>☐ ☒ ☒ ☐ ☐</td>
</tr>
<tr>
<td>Statement</td>
<td>There is no evidence to support watchful waiting as a management strategy in men with <strong>symptomatic</strong> inguinal hernias. No data exist on the risk of incarceration or strangulation in this population.</td>
<td>☐ ☐ ☒ ☐ ☐</td>
</tr>
<tr>
<td>Statement</td>
<td>Most men with <strong>minimally symptomatic or asymptomatic</strong> inguinal hernias will develop symptoms and require surgery.</td>
<td>☒ ☒ ☐ ☐ ☐</td>
</tr>
</tbody>
</table>

**Recommendation** Although most patients will develop symptoms and need surgery, watchful waiting for **minimal or asymptomatic** inguinal hernias is safe since the risk of hernia complications is low and can be recommended. | ☐ ☒ ☐ ☐ ☐ Strong |

**Recommendation** Discussions with patients about timing of hernia repair are recommended to involve attention to social environment, occupation and overall health. The lower morbidity of elective surgery has to be weighed against the higher morbidity of emergency surgery. | ☐ ☐ ☐ ☐ Strong *upgraded* |
# Chapter 6  Surgical Treatment of Inguinal Hernia

**KQ06.a** Which non mesh technique is the preferred repair method for inguinal hernias?

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>The Shouldice technique has lower recurrence rates than other suture repairs and is recommended in non-mesh inguinal hernia repair.</th>
<th>Strong</th>
</tr>
</thead>
</table>

**KQ06.b** Which is the preferred repair method for inguinal hernias: Mesh or non-mesh?

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>A mesh-based repair technique is recommended for patients with symptomatic inguinal hernias.</th>
<th>Strong</th>
</tr>
</thead>
</table>

| Statement | Whether a non-mesh technique is an alternative for mesh-based techniques in individual cases (e.g. young males with lateral hernia L1) is unknown and requires further study. |
|-----------|-------------------------------------------------------------------------------------------------|--------|

**KQ06.c** Which is the preferred open mesh technique for inguinal hernias: Lichtenstein or other open flat mesh and gadgets via an anterior approach?

| Statement | The recurrence rate and postoperative chronic pain are comparable between plug-and-patch/PHS and the Lichtenstein technique. |
|-----------|-------------------------------------------------------------------------------------------------|--------|

| Statement | Self-gripping meshes do not provide any benefit in the short- and medium-term versus the Lichtenstein technique except a somewhat decreased operative time. |
|-----------|-------------------------------------------------------------------------------------------------|--------|

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Despite comparable results, the plug-and-patch and PHS are not recommended because of the excessive use of foreign material, the need to enter both the</th>
<th>Strong</th>
</tr>
</thead>
</table>

*upgraded
posterior and anterior plane and the additional cost.

**Recommendation**
The use of other meshes or gadgets to replace the standard flat mesh in the Lichtenstein technique is currently not recommended.  

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**KQ06.d** Which is the preferred open mesh technique for inguinal hernias: Lichtenstein or any open pre-peritoneal technique?

<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>Open pre-peritoneal mesh repairs may, in the short term (one year), result in less postoperative and chronic pain and faster recovery. It must however be considered that some of these approaches use both anterior and posterior anatomical planes.</th>
</tr>
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<tr>
<td><strong>Score</strong></td>
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</table>

<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>Use of mesh devices results in increased costs and there are possible issues with the memory ring in some.</th>
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<tbody>
<tr>
<td><strong>Score</strong></td>
<td>☒ ☒ ☒ ☒</td>
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<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>In open surgery there is insufficient evidence to recommend a pre-peritoneal mesh repair over Lichtenstein repair.</th>
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<tbody>
<tr>
<td><strong>Score</strong></td>
<td>☒ ☒ ☒ ☒</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>The use of open pre-peritoneal mesh techniques to replace the standard flat mesh in the Lichtenstein technique is suggested to only be performed in research settings.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Score</strong></td>
<td>☒ ☒ ☒ ☒                                                                                                                                  Weak</td>
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</tbody>
</table>

**KQ06.e** Is TEP or TAPP the preferred laparo-endoscopic technique?

<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>TAPP and TEP have similar operative times, overall complication risks, postoperative acute and chronic pain incidence and recurrence rates.</th>
</tr>
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<tbody>
<tr>
<td><strong>Score</strong></td>
<td>☒ ☒ ☒ ☒</td>
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<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>Although very rare, there is a trend in TAPP for more visceral injuries.</th>
</tr>
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<tbody>
<tr>
<td><strong>Score</strong></td>
<td>☒ ☒ ☒ ☒</td>
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<tr>
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<td>☒ ☒ ☒ ☒</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>Although very low, in TAPP the frequency of port-site hernias is higher.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Score</strong></td>
<td>☒ ☒ ☒ ☒</td>
</tr>
</tbody>
</table>
**Statement**  Although very low, in TEP the conversion rate is higher. ☒ ☒ ☒ ☐

**Statement**  Similar costs may be incurred in TAPP and TEP. ☒ ☒ ☒ ☐

**Statement**  TEP has a longer learning curve than TAPP. ☒ ☐ ☐ ☐

**Recommendation**  In laparo-endoscopic inguinal hernia repair, TAPP and TEP have comparable outcomes; hence it is recommended that the choice of the technique should be based on the surgeon’s skills, education and experience. ☒ ☒ ☒ ☐  Strong

**KQ06.f**  When considering recurrence, pain, learning curve, postoperative recovery and costs which is preferred technique for inguinal hernias: Best open mesh (Lichtenstein) or a laparo-endoscopic (TEP and TAPP) technique?

**Statement**  When the surgeon has sufficient experience in the laparo-endoscopic techniques, comparable recurrence rates to Lichtenstein repair can be achieved. ☒ ☒ ☒ ☐

**Statement**  When the surgeon has sufficient experience in the technique, laparo-endoscopic techniques do not take longer than Lichtenstein operations. ☒ ☒ ☒ ☐

**Statement**  With sufficient experience, no significant differences are observed in the perioperative complications needing reoperation between the laparo-endoscopic and Lichtenstein techniques. ☒ ☒ ☒ ☐

**Statement**  The direct operative costs for laparo-endoscopic inguinal hernia repair are higher. That difference decreases when the total community costs are taken into account and the surgeon has sufficient experience. ☒ ☒ ☒ ☐

**Statement**  The learning curve for laparo-endoscopic techniques (especially TEP) is longer than for Lichtenstein. There are rare but severe complications mainly described early in the learning curve. Therefore, it is imperative that laparo-endoscopic techniques be learned in a properly supervised manner. ☒ ☐ ☐ ☐
**Recommendation**

For male patients with primary unilateral inguinal hernia, a laparo-endoscopic technique is recommended because of a lower postoperative pain incidence and a reduction in chronic pain incidence, provided that a surgeon with specific and sufficient resources is available. However, there are patient and hernia characteristics that warrant a Lichtenstein as first choice. (see chapter 7 on individualization)

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**KQ06.g** In males with unilateral primary inguinal hernias which is the preferred repair technique, laparo-endoscopic (TEP/TAPP) or open pre-peritoneal?

**Statement**
The outcome measures of morbidity, mortality, and recurrence rates do not seem not significantly different between laparoscopic and open pre-peritoneal repair.

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**Statement**
With regards to visualization, laparoscopic pre-peritoneal repair is a safe and standardized operation with possible technical advantages over open.

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**Statement**
Especially in lower resource settings, techniques utilizing open pre-peritoneal mesh placement may be become an acceptable alternative to laparoscopic pre-peritoneal mesh repair.

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**Statement**
No recommendation to advocate laparoscopic pre-peritoneal mesh placement over open pre-peritoneal repairs can be made due to insufficient and heterogeneous data.

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**KQ06.h** Which is the preferred technique in Bilateral hernia.

**Recommendation**
From a socio-economic perspective, a laparo-endoscopic repair is recommended in bilateral hernia repair, provided expertise is available

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**Chapter 7  Individualization of Treatment Options**

**KQ07.a** In inguinal hernia repair, when should treatment be individualized?
**Recommendation**  
In patients with primary bilateral hernias a laparo-endoscopic approach is recommended provided expertise is available.  

**Recommendation**  
In patients with pelvic pathology or scarring due to radiation or pelvic surgery, or for those on peritoneal dialysis, consider an anterior approach.

**Recommendation**  
It is recommended that surgeons tailor treatments based on expertise, local/national resources, and patient- and hernia-related factors.

**Recommendation**  
Since a generally accepted technique, suitable for all inguinal hernias, does not exist, it is recommended that surgeons/surgical services provide both an anterior and a posterior approach option.

### Chapter 8  Occult Hernias and Bilateral Repair

**KQ08.a** In those with unilateral overt primary IHs, what is the likelihood they will also have a contralateral occult IH?

**KQ08.b** In those with unilateral overt primary IHs, what is the likelihood they will develop contralateral overt hernias over time?

**KQ08.c** In patients who have undergone a unilateral TEP and negative contralateral exploration, what is the risk of developing an overt hernia on the disease-free side?

**KQ08.d** In cases where an occult contralateral IH is seen during TAPP will it become symptomatic if not repaired?

**KQ08.e** In those with overt unilateral primary IHs without contraindications to bilateral TEP or TAPP repair, should bilateral repair be performed?

**Statement**  
In patients with unilateral overt primary inguinal hernias, an occult contralateral inguinal hernia is seen at time of laparoscopic inguinal hernia surgery in up to 58% of cases.

**Statement**  
In patients who have undergone a unilateral inguinal hernia repair, the chance of developing a contralateral inguinal hernia increases with time; however, the true incidence is
unknown.

<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>There is a low risk for the development of a contralateral overt inguinal hernia following a previously negative TEP exploration.</th>
<th>☐☐☐</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Statement</strong></td>
<td>The percentage of occult hernias noted at TAPP that become symptomatic will increase over time; however, the true incidence is unknown.</td>
<td>☐☐☐</td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
<td>It is recommended that the contralateral groin be inspected at time of TAPP repair. If a contralateral inguinal hernia is found and prior informed consent was obtained, repair is recommended.</td>
<td>☐☐☐</td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
<td>In those with overt unilateral primary inguinal hernias without contralateral hernias, routine bilateral TAPP repair is not suggested.</td>
<td>☐☐☐</td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
<td>Routine exploration by TEP of the contralateral groin in an asymptomatic patient with no clinical hernia is not suggested.</td>
<td>☐☐☐</td>
</tr>
</tbody>
</table>

**Chapter 9  Day Surgery**

KQ09.a Which inguinal hernias can be safely repaired in day surgery?

KQ09.b Can endoscopic and open herniorrhaphies be performed safely in day surgery?

KQ09.c Can patients with severe comorbidities (ASA III or higher) be safely treated in day surgery?

KQ09.d Can patients with complex inguinal hernias (e.g. scrotal hernias) be safely treated in day surgery?

| **Recommendation** | Day surgery is recommended for the majority of groin hernia patients provided adequate aftercare is organized. | ☐☐☐  |
| **Recommendation** | Day surgery is suggested for all endoscopic repairs of simple inguinal hernias provided adequate aftercare is organized. | ☐☐☐  |
**Chapter 10  Meshes**

**KQ10.a** Do mesh characteristics (i.e., flatness and pore size) have an impact on outcome?

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Day surgery is suggested for selected older and ASA IIIa patients (open repair under local anesthesia) provided adequate aftercare is organized.</th>
<th>☐☐☐☐</th>
<th>Weak</th>
</tr>
</thead>
</table>

**KQ10.b** Do lightweight meshes have benefits in open or laparoscopic IH repair?

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Day surgery for patients with complex inguinal hernias is suggested only in selected cases.</th>
<th>☐☐☐☐</th>
<th>Weak</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Hernia surgeons should be aware of the clinical characteristics of the meshes they use.</th>
<th>☒☐☐☐</th>
<th>Strong *upgraded</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Use of so-called LWM in inguinal hernia surgery (open and laparoscopic) may have some short-term benefits (reduced postoperative pain and shorter convalescence).</th>
<th>☒☐☐☐</th>
<th>Strong *upgraded</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Before a clear definition of LWM and HWM exists, the selection of mesh based solely on the terms “lightweight” or “heavyweight” is not recommended.</th>
<th>☒☐☐☐</th>
<th>Strong *upgraded</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Recently published meta-analyses and RCTs do not support the contention that LWMs in groin hernia surgery are associated with better postoperative outcomes.</th>
<th>☒☐☐☐</th>
<th></th>
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</thead>
</table>

<table>
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<tr>
<th><strong>Recommendation</strong></th>
<th>Subset analyses did not find higher recurrence rates with the use of LWMs in laparoscopic inguinal hernia repair.</th>
<th>☒☐☐☐</th>
<th></th>
</tr>
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</table>

<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>Evidence supports the contention that mesh characteristics influence clinical outcomes.</th>
<th>☒☐☐☐</th>
<th></th>
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</table>

<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th>The effect of pore size alone on clinical outcome has not been investigated in clinical trials; therefore, no recommendation can be made.</th>
<th>☐☐☐☐</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
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</table>

<table>
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<tr>
<th><strong>Statement</strong></th>
<th>Use of so-called LWM in inguinal hernia surgery (open and laparoscopic) may have some short-term benefits (reduced postoperative pain and shorter convalescence).</th>
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</table>

<table>
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<tr>
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<tr>
<th><strong>Statement</strong></th>
<th>Subset analyses did not find higher recurrence rates with the use of LWMs in laparoscopic inguinal hernia repair.</th>
<th>☒☐☐☐</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
<td>There exists no clearly defined weight limit for LWMs and HWMs. Therefore, the effect of weight differences alone on surgical outcomes is unknown.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommendation</td>
<td>Mesh selection based on weight alone is not recommended nor supported by the available literature.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**KQ10.d** Does chronic inflammation occur at mesh/tissue interfaces?

No statements

**KQ10.e** Is late-onset mesh migration unavoidable?

| Statement | There is a lifetime risk for mesh migration which seems to be higher with plugs versus flat mesh. |
| Recommendation | There is a lifetime risk for mesh migration. Mesh-related complications—including erosion and migration—should be considered in the differential diagnosis in patients with relevant symptoms in the region of their mesh. |

**KQ10.f** Do mesh polymers elicit rejection reactions?

| Statement | There is no evidence of true immunologically-based rejection of current synthetic mesh materials. |

**KQ10.g** Does mesh degradation occur?

No statements

**KQ10.h** Which mesh options—in structure and stability—should be considered?

No Statements
KQ10.i Is there a risk for carcinogenesis at meshes’ interfaces?

no Statements

KQ10.j Is there an age-associated risk for mesh-related complications?

Statements

no statements

KQ10.k Does mesh shrinkage occur, and if so, to what extent?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Specific contraindications for flat meshes made from polymers are not known, even when adjusting for age. However, the risks of mesh-related complications increase with increasing implantation duration.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mesh shrinkage of at least 20% has to be accounted for depending on mesh structure and host tissue response.</td>
</tr>
<tr>
<td></td>
<td>There is no evidence of mesh-related carcinogenesis.</td>
</tr>
</tbody>
</table>

Chapter 11 Mesh Fixation

KQ11.a Which fixation methods are appropriate in primary open anterior mesh inguinal and femoral hernia repairs in those over 18 years of age?

<table>
<thead>
<tr>
<th>Statement</th>
<th>In open anterior mesh groin hernia repairs there are no differences in recurrence, surgical site infection rates or length of stay between different fixation methods. Fixation with glue (fibrin sealant or cyanoacrylate) may reduce early postoperative and chronic pain.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Atraumatic mesh fixation in open inguinal hernia repair techniques is suggested to reduce early postoperative pain.</th>
</tr>
</thead>
</table>

KQ11.b Is mesh fixation necessary in endoscopic TEP inguinal/femoral hernia repair in adults?

KQ11.c Are there specific indications for mesh fixation in endoscopic TEP inguinal/femoral hernia repair in adults?

KQ11.d Is mesh fixation ever recommended in laparoscopic TAPP inguinal/femoral hernia repair in adults?
KQ11.e If using mesh fixation, what types should be used in TEP and TAPP inguinal/femoral hernia repairs?

**Statement**
In almost all cases, any type of mesh fixation in TEP repair is unnecessary.

**Statement**
Atraumatic mesh fixation techniques are favored to reduce early postoperative pain.

**Recommendation**
Traumatic mesh fixation (tackers) is recommended in patients with large direct hernias (M3-EHS classification) undergoing TAPP or TEP to reduce recurrence risk.

---

Chapter 12 Antibiotic Prophylaxis

**KQ12.a** Are prophylactic antibiotics indicated in open mesh repair in an average-risk patient in a low-risk environment?

**KQ12.b** Are prophylactic antibiotics indicated in open mesh repair in a high-risk patient in a low-risk environment?

**KQ12.c** Are prophylactic antibiotics indicated in open mesh repair in any patient in a high-risk environment?

**KQ12.d** Are prophylactic antibiotics indicated in laparoscopic repair in any patient in any risk environment?

**Recommendation**
In open mesh repair, administration of antibiotic prophylaxis in average-risk patients in a low-risk environment is not recommended.

**Recommendation**
Administration of antibiotic prophylaxis in open mesh repair in high-risk patients in a low-risk environment is suggested.

**Recommendation**
Administration of antibiotic prophylaxis in open mesh repair in any patient in a high-risk environment is recommended.

**Recommendation**
In laparo-endoscopic repair in any patient in any risk environment, antibiotic prophylaxis is not recommended.
Chapter 13 Anesthesia

KQ13.a Does local anesthesia influence outcomes after open repair of reducible inguinal hernia when compared with general or regional anesthesia?

| Statement | When compared with general anesthesia, local anesthesia is associated with faster mobilization, earlier hospital discharge, lower hospital and total healthcare costs, and fewer complications such as urinary retention and early postoperative pain. However, when surgeons inexperienced in its use administer local anesthesia, more hernia recurrences might result. | ☐ ☒ ☒ ☒ |

| Statement | When compared with regional anesthesia, local anesthesia is associated with earlier hospital discharge, lower hospital and total healthcare costs, and a lower incidence of urinary retention. However, when surgeons inexperienced in its use administer local anesthesia, more hernia recurrences might result. | ☐ ☒ ☒ ☒ |

| Recommendation | Local anesthesia is recommended for open repair of reducible inguinal hernias provided surgeons experienced in local anesthesia use administer the local anesthetic. | ☐ ☐ ☒ ☒|

| Recommendation | Correctly performed local anesthesia is suggested to be a good alternative to general or regional anesthesia in patients with severe systemic disease. | ☐ ☐ ☒ ☒ |

KQ13.b Are outcomes different when open inguinal hernia repairs are performed with regional versus general anesthesia?

| Statement | When compared with regional anesthesia, general anesthesia offers no clear advantages regarding the incidence of postoperative pain, postoperative nausea, cost, or patient satisfaction. Its use allows for faster patient discharge, which is of uncertain clinical significance. Some studies report a higher incidence of urinary retention with regional anesthesia. | ☐ ☒ ☒ ☒ |

| Statement | When compared with general anesthesia, regional anesthesia in patients aged 65 and older might be associated with a higher incidence of medical complications like myocardial infarction, pneumonia and venous thromboembolism. | ☐ ☒ ☒ ☒ |
| Recommendation | General or local anesthesia is suggested over regional in patients aged 65 and older. | weak |

### KQ13.c Can surgical residents/registrars safely perform open inguinal hernia repair using local anesthesia?

| Statement | Open inguinal hernia repair under local anesthesia can be safely performed by trainees under supervision of surgeons experienced in the administration of local anesthesia. |

### Chapter 14 Early Postoperative Pain Prevention and Management

#### KQ14.a Do preoperative or perioperative local anesthetic methods affect patients’ pain experiences after open groin hernia repair?

| Statement | When general or regional anesthesia is used, the addition of local anesthetic field blocks of the ilioinguinal and iliohypogastric nerves and/or subfascial and subcutaneous infiltration reduces early postoperative pain scores and the need for other analgesics. |

| Statement | Long-acting local anesthetics are preferable to short-acting local anesthetics but the timing of field blocks and/or infiltration—either preoperatively or at wound closure—has no proven effect on the occurrence of postoperative pain. |

| Statement | NSAID or selective COX-2 inhibitors reduce postoperative pain and when given with paracetamol reduce postoperative pain further. |

| Recommendation | Preoperative or perioperative local anesthetic measures like field blocks of the inguinal nerves and/or subfascial/subcutaneous infiltration are recommended in all open groin hernia repairs. | strong |

| Recommendation | Use of a conventional NSAID or a selective COX-2 inhibitor plus paracetamol is recommended in open groin hernia repairs provided that there are no contraindications. | strong |

### Chapter 15 Convalescence
**KQ15.a** What is the recommended duration of convalescence following uncomplicated inguinal hernia repair

<table>
<thead>
<tr>
<th>Statement</th>
<th>Physical activity restrictions are unnecessary after uncomplicated inguinal hernia repair and do not effect recurrence rates. Patients should be encouraged to resume normal activities as soon as possible.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td>□ □ □ □ *Upgraded</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>An early return to normal activities can safely be recommended.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td>□ □ □ □ *Upgraded</td>
</tr>
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</table>

**Chapter 16  Groin Hernias in Women**

**KQ16.a** In women with a groin lump, what is the best diagnostic modality and is a preoperative diagnosis necessary?

**KQ16.b** What is the optimal treatment for women with groin hernias?

**KQ16.c** What is the risk of incarceration/strangulation in women with groin hernias? What is the incidence of emergent inguinal/femoral hernia repair in women? What are the outcomes?

<table>
<thead>
<tr>
<th>Statement</th>
<th>No clinical or diagnostic tests can reliably distinguish inguinal from femoral hernias.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td>□ □ □ □</td>
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</table>

<table>
<thead>
<tr>
<th>Statement</th>
<th>Femoral hernias occur more often in women.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td>□ □ □ □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statement</th>
<th>Femoral hernias are more likely than inguinal hernias to incarcerate and strangulate.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td>□ □ □ □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Provided that expertise is available, women with groin hernias are recommended to undergo laparoscopic repair with preperitoneal mesh implantation.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td>□ □ □ □ *Upgraded</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Timely hernia repair is recommended in women with groin hernias.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td>□ □ □ □ *Upgraded</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Recommendation</strong></th>
<th>Physicians should consider femoral hernia in the differential diagnosis of groin swelling in women.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td>□ □ □ □</td>
</tr>
</tbody>
</table>
KQ16.d How is a groin lump in a pregnant female diagnosed and treated?

**Statement**

Groin hernia formation is uncommon during pregnancy.

**Statement**

The most likely diagnosis in a woman with the onset of a groin lump during pregnancy is round ligament varicosity.

**Recommendation**

Watchful waiting is suggested in pregnant females with groin swelling

KQ16.e Should the round ligament be preserved in women who undergo groin hernia repair?

**Statement**

Division of the genital branch of the genitofemoral nerve carries a small risk of deafferentation, hypersensitivity, and ipsilateral labial numbness.

**Recommendation**

It is suggested to avoid division of the round ligament in open repair. If division of the round ligament is done in laparoscopic repair, it should preferentially be performed proximal to the genital branch meeting at the fusion with the peritoneum.

Chapter 17  Femoral Hernias

KQ17.a Is there a recurrence rate difference between suture and mesh open femoral hernia repairs?

KQ17.b Following femoral hernia repair are there differences in recurrence rates, complications or the incidence of chronic pain between open anterior mesh repair and open posterior mesh repair?

KQ17.c Following open and endoscopic femoral hernia repairs are there differences in recurrence rates, postoperative pain and complications?

KQ17.d Should asymptomatic femoral hernias always be treated surgically?

**Statement**

Preperitoneal mesh repair results in significantly fewer recurrences and less postoperative pain and foreign body sensation.

**Statement**

Laparo-endoscopic repair of femoral hernias results in significantly fewer recurrences and less postoperative pain.
Laparo-endoscopic repair offers the opportunity to establish correct diagnoses in cases where preoperative diagnoses were incorrect.

**Recommendation**  
Mesh should be used in elective femoral hernia repairs.  

**Recommendation**  
Providing expertise is available, a laparo-endoscopic procedure is recommended for elective femoral hernia repair.

**Recommendation**  
Timely elective repair is recommended for all patients with femoral hernias.

**Chapter 18**  
Complications – Prevention and Treatment

**KQ18.a** Is early postoperative pain associated with increased urinary retention risk?

**KQ18.b** Is there an age-associated postoperative urinary retention risk?

**KQ18.c** Does intraoperative parenteral fluid restriction reduce urinary retention risk?

**KQ18.d** Is there an increased risk of postoperative urinary retention with open anterior repair?

**KQ18.e** When is prophylactic urinary bladder catheterization indicated before hernia operation?

**KQ18.f** Is there effective prophylactic medication to decrease urinary retention?

**Statement**  
There is only indirect evidence that pain results in increased urinary retention rates based upon the experience with painful tack fixation vs non-fixation techniques. LOE = weak

**Statement**  
Urinary retention after inguinal hernia repair increases with age.

**Statement**  
Minimizing the amount of parenteral fluids given to patients undergoing inguinal herniorrhaphy may result in a lower incidence of urinary retention.

**Statement**  
Open anterior repair performed under local anesthesia has a decreased incidence of urinary retention compared to endoscopic repair.
<table>
<thead>
<tr>
<th>Statement</th>
<th>There is no difference in the incidence of urinary retention between open repair and endoscopic repair when performed under general anesthesia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
<td>There is no evidence that routine use of a urinary catheter is necessary for either conventional or laparoscopic inguinal herniorrhaphy. Therefore, its use should be discouraged in favor of immediate voiding prior to operation. A history of a prostatectomy or previous urinary emptying problems is a relative indication for urinary catheterization.</td>
</tr>
<tr>
<td>Statement</td>
<td>Prazosin, phenoxybenzamine hydrochloride or tamsulosin may be effective in preventing urinary retention.</td>
</tr>
</tbody>
</table>

**KQ18.g** What defines “sexual dysfunction” after IH surgery?
**KQ18.h** What is the incidence of sexual dysfunction after IH surgery?
**KQ18.i** Are ischemic orchiditis causes known; and can this complication be prevented?
**KQ18.j** Does hernia repair with heavyweight mesh cause more testicular pain than hernia repair with lightweight mesh?
**KQ18.k** Are methods of repair or bilateral operation related to risks of impaired spermatogenesis and hormone production?
**KQ18.l** Can sexual dysfunction following hernia repair be treated surgically?

<table>
<thead>
<tr>
<th>Statement</th>
<th>The incidence of sexual dysfunction causing moderate-to-severe symptoms is around 5-7%. Impairment of testicular function and fertility occurs in less than 1%.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
<td>There is a risk of damage to the spermatic artery and/or vein causing testicular ischemia and orchitis when dissecting the spermatic cord in both open and laparoscopic techniques.</td>
</tr>
<tr>
<td>Statement</td>
<td>There is no significantly increased long-term risk of impaired spermatogenesis and hormone production related to methods of repair or bilateral surgical procedures.</td>
</tr>
<tr>
<td>Statement</td>
<td>Painful conditions interfering with sexual function can be improved by operative techniques used for treatment of neuropathic pain, release of the spermatic cord and mesh removal.</td>
</tr>
</tbody>
</table>
KQ18.m Is hematoma formation related to hernia repair method or mesh use?

KQ18.n Are intraoperative bleeding and postoperative hematoma formation related to a surgeon’s level of experience?

| Statement | Hematoma incidence is reduced after endoscopic IH repair compared with open repair. | ☒ ☒ ☐ ☐ Strong |
| Statement | There is inadequate medical evidence to link hematoma formation risk to a surgeon’s level of experience. | ☐ ☐ ☐ ☐ |

KQ18.o Which patients undergoing anticoagulant or antiplatelet therapy are at risk of significant hematoma formation following hernia repair?

| Statement | Perioperative management of patients on anticoagulant or antiplatelet therapy should be governed by local or institutional protocol. | ☐ ☐ ☐ |
| Recommendation | Endoscopically a highly cautious approach should be taken when operating on patients undergoing anticoagulant or antiplatelet therapy even after bridging with LMWH. The development of local protocols is suggested to guide management of these patients. | ☐ ☐ ☐ ☐ Weak |

KQ18.p What are the risk factors for postoperative seroma formation?

KQ18.q Is there an association between open anterior repair method and postoperative seroma formation?

KQ18.r Do certain endoscopic or open preperitoneal techniques increase the risk of postoperative seroma formation?

KQ18.s Can the risk of postoperative seroma formation be reduced surgically?

KQ18.t Does drain usage reduce the risk of postoperative seroma formation?

KQ18.u Is there an association between hernia sac treatment modality and seroma/hematoma formation?

KQ18.v Does the use of abdominal binders or comparable wound compression devices prevent seroma/hematoma formation?

| Statement | The risk factors for postoperative seroma formation include: scrotal hernia, coagulopathy and congestive liver failure. | ☒ ☒ ☐ ☐ |
| Statement | Inverting and fixing the lax fascia transversalis during | ☒ ☒ ☐ ☐ |
laparoscopic repair of large direct hernia sacs may reduce the risk of seroma and hematoma formation.

KQ18.w How common are serious complications during hernia surgery?

KQ18.x Are serious complications more common during endoscopic hernia surgery in patients with a history of previous abdominal surgery?

KQ18.y Is mesh migration—with the attendant risk of pain and severe complications—related to: mesh type, mesh shape, repair method, wound infection, or hernia type?

Statement

Serious complications—bowel, bladder and vascular injuries—rarely occur during hernia surgery although they are more common during laparo-endoscopic versus open hernia repair.

Statement

Patients with a history of lower abdominal surgery have an increased risk of visceral damage during laparo-endoscopic hernia repair.

KQ18.z What is the 30-day mortality rate following groin hernia repair? What are the causes of this mortality?

Statement

Death in the 30 days following inguinal hernia repair is very rare and mainly associated with emergent repair.

Statement

Femoral hernias are associated with an increased likelihood of emergent repair.

Statement

Mortality in the 30 days following elective hernia repair is mainly related to medical comorbidities.

Chapter 19  Pain – Prevention (P) and Treatment (T)

Pain prevention

KQ19P.a How is chronic pain defined? What is its prevalence after IH repair?

Statement

Ten to 12% of inguinal hernia repair patients experience at least a level of moderate pain that impacts daily activities.

Recommendation

Chronic pain should be defined as ≥ bothersome moderate pain impacting daily activities lasting ≥ three months postoperatively.

KQ19P.b What are the risk factors for CPIP?
### CPIP risk factors include:
- young age,
- female gender,
- high preoperative pain,
- early high postoperative pain,
- recurrent hernia and open hernia repair.

<table>
<thead>
<tr>
<th>Statement</th>
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<tbody>
<tr>
<td>CPIP risk factors include: young age, female gender, high preoperative pain, early high postoperative pain, recurrent hernia and open hernia repair.</td>
</tr>
<tr>
<td><strong>KQ19P.d</strong></td>
</tr>
<tr>
<td>No Statement</td>
</tr>
<tr>
<td><strong>KQ19P.e</strong></td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
</tr>
<tr>
<td><strong>KQ19P.f</strong></td>
</tr>
<tr>
<td><strong>KQ19P.g</strong></td>
</tr>
<tr>
<td><strong>KQ19P.h</strong></td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
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<tr>
<td><strong>Recommendation</strong></td>
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<tr>
<td><strong>Recommendation</strong></td>
</tr>
<tr>
<td><strong>KQ19P.i</strong></td>
</tr>
<tr>
<td><strong>Recommendation</strong></td>
</tr>
<tr>
<td><strong>KQ19P.j</strong></td>
</tr>
<tr>
<td><strong>Statement</strong></td>
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</tbody>
</table>

31
ligation, is associated with a reduction in the incidence of acute postoperative pain but an increased incidence of recurrence.

**Statement**
A possible increase in pain incidence should be weighed against a possible increase in recurrence incidence when considering indirect hernia sac ligation.

**KQ19P.k** Does mesh fixation to the pubic bone increase the incidence of acute and/or chronic pain?

**Recommendation**
Mesh fixation to the pubic bone is not recommended since this leads to an increased incidence of chronic pain.  

**KQ19P.l** What percentage of CPIP patients have orchialgia?

**Recommendation**
Minimizing surgical trauma to the spermatic cord is recommended to reduce orchialgia incidence.

**KQ19P.m** Can preoperative and perioperative topical and systemic medications reduce the incidence of chronic pain?

**Statement**
Topical and/or oral medical therapy given preoperatively or intraoperatively has not been shown to reduce the incidence of chronic pain following hernia surgery.

**KQ19P.n** Can chronic postoperative pain be prevented or reduced by preoperative information and psychological preparation?

**Pain treatment**

*Chronic postoperative pain treatment after inguinal hernia repair*

**KQ19T.a** How should inguinal hernia repair patients with immediate, severe, postoperative pain be treated?

**Recommendation**
Immediate severe/excruciating postoperative pain raises the possibility of vascular or nerve injury. Early re-operation is suggested to either exclude or manage these...
KQ19T.b What should the initial approach be to IH repair patients with chronic postoperative pain (pain still present > three months after surgery)? (see treatment algorithm)

**Recommendation**

A multidisciplinary team is suggested to manage chronic pain patients.

Pharmacologic and interventional measures—including diagnostic and therapeutic nerve blocks—should continue for a minimum of three months (minimum of six months after hernia surgery).

**KQ19T.c** Does non-pharmacological treatment work in CPIP?

**Statement**

No benefit has been shown for lidocaine and capsaicin patch treatment of CPIP.

**KQ19T.d** What is the effect of non-surgical interventional treatment on chronic pain after IH repair?

**Statement**

There is insufficient evidence of the diagnostic and therapeutic value of nerve blocks in chronic pain after inguinal hernia repair. In clinical practice however, nerve blocks can be useful in the diagnostic and therapeutic management of chronic pain after inguinal hernia repair.

**Statement**

Pulsed radio frequency ablation may be an effective treatment for chronic pain after inguinal hernia repair.

**Statement**

Early findings suggest that neuromodulation of the Dorsal Root Ganglia (DRG) may be an effective treatment for chronic neuropathic pain conditions in the groin region.

**KQ19T.e** Is mesh removal without intentional neurectomy an effective treatment for chronic pain after IH repair?

**Statement**

There is insufficient evidence to support mesh removal alone without neurectomy in patients with CPIP.

**KQ19T.f** What type of neurectomy should be performed in patients with chronic neuropathic pain (> 3 months) after IH repair?

**Statement**

For chronic neuropathic pain after open hernia repair, both open neurectomy and endoscopic retroperitoneal neurectomy provide weak evidence.
acceptable outcomes.

**Recommendation**
A tailored approach to neurectomy with or without mesh removal is suggested depending on the original repair method and presentation. The decision about neurectomy type - selective or triple - is best left to the surgeon’s discretion.  

### Chapter 20  Recurrent Inguinal Hernias

**KQ20.a** Are recurrence rates still too high despite innovations like endoscopic repair, anterior preperitoneal repair and new mesh prosthetics?

**Statement**
Recurrence rates worldwide are still too high despite numerous innovations in inguinal hernia surgery.  

**KQ20.b** Is surgery necessary for all recurrence patients?

**Statement**
There is no evidence to support a watchful waiting management strategy for those with recurrent inguinal hernias.

**KQ20.c** Which management strategy is best for recurrence after anterior repair?

**Statement**
Open pre-peritoneal repair avoiding an approach through scar tissue can be an alternative surgical technique after failed anterior tissue repair or Lichtenstein repair.

**Recommendation**
Laparo-endoscopic recurrent inguinal hernia repair is recommended after failed anterior tissue or Lichtenstein repair.

**KQ20.d** What is the best operation for a recurrence after TEP/TAPP?

**Recommendation**
Anterior repair is recommended after a failed posterior repair.
**KQ20.e** What is the optimal management strategy in the case of recurrent hernia after failed anterior and posterior (laparoscopic or anterior pre-peritoneal) repair?

**Recommendation** An expert hernia surgeon should repair a recurrent IH after a failed anterior and posterior repair. The choice of technique depends on patient- and surgeon-specific factors.  

**Statement** Increased morbidity and mortality are found amongst incarcerated/strangulated groin hernia patients with: age > 65 years, increased ASA classification, increased symptom duration, increased weight, necessity for bowel resection, presence of a recurrent hernia, femoral hernia presence, female gender, oral anticoagulant use, and presence of bowel obstruction.

**KQ20.f** What are the options for a recurrence with post-herniorrhaphy chronic groin pain?

**Recommendation** There are no studies to guide decision making for recurrent hernia patients with post-herniorrhaphy chronic groin pain. It is suggested that patients with this condition be management by an expert hernia surgeon.

**Chapter 21** Emergency Groin Hernia Treatment

**KQ21.a** Which groin hernias in adults are at increased risk for incarceration/strangulation?

**Statement** Risk factors for hernia incarceration/strangulation include: female gender, femoral hernia presence, and a history of hospitalizations related to groin hernias.

**KQ21.b** Which risk factors increase morbidity and mortality in adults with incarcerated/strangulated groin hernias?

**KQ 21.c** Which diagnostic method is most suitable for the detection of incarcerated/strangulated groin hernias in adults?

**Statement** Clinical examination alone is sufficient for the diagnosis of incarcerated/strangulated groin hernias in almost all patients. Groin ultrasound and/or abdominopelvic CT can provide additional diagnostic information and aid decision making in selected cases.
Recommendation | Clinical examination of the groin is recommended in all patients presenting with signs and symptoms of bowel obstruction. | Strong*upgraded

**KQ21.d** Should adults with acutely incarcerated/strangulated IHs undergo repair emergently?

**Statement** | Acutely incarcerated/strangulated groin hernias represent surgical emergencies mandating timely surgery, taking into account preoperative optimization and the capabilities of local surgical facilities.

**KQ 21.e** What is the optimal surgical approach (open anterior vs laparoscopic) for an acutely incarcerated/strangulated groin hernia?

**KQ 21.f** What is the optimal surgical approach (open posterior vs laparoscopic) for an acutely incarcerated/strangulated groin hernia?

**KQ 21.g** What is the optimal open surgical approach (anterior vs posterior) for an acutely incarcerated/strangulated groin hernia?

**KQ 21.h** What is the optimal laparoscopic surgical approach (TAPP vs TEP) for an acutely incarcerated/strangulated groin hernia?

**KQ21.i** In patients with intestinal incarceration without signs of intestinal strangulation or concurrent bowel resection (i.e. a clean surgical field) is mesh-based repair recommended?

**KQ21.j** In patients with intestinal incarceration without signs of intestinal strangulation or concurrent bowel resection (i.e. a clean surgical field), which mesh is recommended?

**KQ21.k** In patients with intestinal strangulation and/or concurrent bowel resection (clean-contaminated surgical field) is mesh-based repair recommended?

**KQ21.l** In patients with intestinal strangulation and/or concurrent bowel resection (clean-contaminated surgical field), which mesh is recommended?

**Recommendation** | A tailored approach is suggested for adult patients with acutely incarcerated/strangulated groin hernias since there is no evidence supporting an optimal surgical approach. | Weak

**Recommendation** | Similar to clean elective hernia surgery, mesh repair is suggested in clean emergent hernia surgery. | Weak
**KQ21.m** In stable patients with strangulated obstruction and peritonitis caused by a bowel perforation or an abscess due to necrosis of the omentum (contaminated-dirty surgical field) is mesh repair recommended?

**KQ21.n** In stable patients with strangulated obstruction and peritonitis caused by a bowel perforation or an abscess due to necrosis of the omentum (contaminated-dirty surgical field), which mesh is recommended?

**Recommendation**

Mesh-based repair is suggested in emergent groin hernia surgery with a clean or clean-contaminated surgical field.

- Weak

**Statement**

Little evidence exists comparing the implantation of mesh of various types in non-clean surgical fields. Large-pore monofilament polypropylene, biological and biodegradable meshes have unknown effects on mesh-infection risks.

- Weak

**Recommendation**

It is suggested not to use mesh during emergent groin hernia repair in a contaminated-dirty surgical field.

- Weak

**Recommendation**

As surgical field contamination status worsens it is recommended that mesh use be ever more conscientiously considered. If mesh is used, the risk/benefit ratio must be carefully contemplated.

- Weak

**KQ21.o** Should adult patients with acutely incarcerated/strangulated groin hernias receive antibiotic prophylaxis or treatment?

**Recommendation**

Prophylactic intravenous antibiotics are suggested during and following emergent hernia surgery. They should be continued as required depending on the contamination level of the surgical field.

- Strong

*upgraded

**KQ21.p** In adults with acutely incarcerated/strangulated groin hernias, does hernia sac laparoscopy (hernioscopy) reduce morbidity and mortality in cases with spontaneous reduction of the hernia before viability assessment?

**KQ21.q** In adults with acutely incarcerated/strangulated groin hernias, is laparoscopy useful to check bowel viability even when an anterior approach is done?
Chapter 22  
Training and the Learning Curve

KQ22.a What is the learning curve for open inguinal hernia repair, anterior approach?
KQ22.b What is the learning curve for open inguinal hernia repair, posterior approach?
KQ22.c What is the learning curve for laparoscopic inguinal hernia repair, TEP?
KQ22.d What is the learning curve for laparoscopic inguinal hernia repair, TAPP?
KQ22.e What are the best methods to teach open hernia repair?
KQ22.f What are the best methods to teach laparoscopic inguinal hernia repair?

Statement
If a surgeon has any concern about bowel viability, bowel visualization is recommended. Depending on surgical approach, expertise, and facilities, bowel visualization may be undertaken by groin exploration, hernia sac laparoscopy, formal laparoscopy or laparotomy.

Statement
Adequate evidence does not exist to assess the learning curve for the open posterior approach.

Statement
Open anterior mesh repair by unsupervised trainees with less than 60 cases or about 3 years' experience is on average associated with higher recurrence rate, longer operative times consistent with limited technical competency.

Statement
Complication rates do not differ between consultants and supervised trainees regardless of training year. However, involvement of trainees may slightly prolong operative times.

Statement
Although learning curves may vary, on average the learning curve for TAPP repair may be similar to the learning curve for TEP repair.
Chapter 23  Specialized Centers and Hernia Specialists

KQ23.a Does a center’s volume affect IH surgery outcomes?

**Statement**
In order for centers and surgeons to be certified as either a hernia center or a hernia specialist, minimal requirements on numbers of operations, follow-up and quality control should be met.

**Recommendation**
A goal-directed curriculum including review of anatomy, procedure steps, intraoperative decision making and proficiency based, simulation enhanced technical skills training should be available to trainees whenever possible.

**Recommendation**
Supervision of trainees should be provided until they have reached safe proficiency levels. This averages around 60 procedures for open and around 100 procedures for laparoscopic hernia repair for novices, depending on individual aptitude and the training environment.

KQ23.b Do surgical volumes affect the outcomes of IH surgeries?

**Statement**
A surgeon’s caseload appears to more important for IH surgery outcomes than a center’s caseload.

**Statement**
A surgeon’s case volume is inversely related to that surgeon’s recurrence rate.

KQ23.c Does facility specialization affect IH surgery outcomes?

KQ23.d Does surgical specialization affect IH surgery outcomes?

**Statement**
Hernia specialists are surgeons with mastery/expert level hernia surgery skills who actively train, educate and perform research in their field.

Chapter 24  Costs
### KQ24.a Is open or endoscopic inguinal hernia repair more cost effective?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Direct institutional costs are lower for open mesh repair than for laparoscopic mesh repair.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Statement</strong> Indirect societal costs are lower for laparoscopic mesh versus open mesh repair.</td>
</tr>
<tr>
<td></td>
<td><strong>Statement</strong> Laparoscopic inguinal hernia repair is overall more cost effective than open inguinal hernia repair.</td>
</tr>
</tbody>
</table>

### KQ24.b What are the costs and cost differences between open and laparoscopic inguinal hernia repair?

<table>
<thead>
<tr>
<th>Statement</th>
<th>The higher institutional costs of laparoscopic inguinal hernia repair are mainly due to the use of expensive disposable equipment.</th>
</tr>
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<tbody>
<tr>
<td></td>
<td><strong>Recommendation</strong> From a cost-effectiveness perspective, day-case laparoscopic inguinal hernia repair with minimal use of disposables is recommended.</td>
</tr>
</tbody>
</table>

### KQ24.c Which surgeon-specific factors result in improved cost effectiveness?

### Chapter 25 Groin Hernia Registries

### KQ25.a When compared with RCTs, do well-validated IH quality registries, and the studies done on their databases, offer additional valuable evidence-based information to hernia surgeons?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Hernia registries, with high coverage, allow monitoring of clinical practice and provide high external validity whereas RCTs define effects of a specific intervention with minimal bias and high internal validity.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Statement</strong> Rare events can be detected early in hernia registries highlighting potential problems soon after new techniques and products are introduced into clinical practice.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>From a cost-effectiveness perspective, day-case laparoscopic inguinal hernia repair with minimal use of disposables is recommended.</th>
</tr>
</thead>
</table>
Registry-based studies are important complements to RCTs, in guideline development.

Countries or regions should develop and implement registries for groin hernia patients.

Chapter 26 Outcomes and Quality Assessment

KQ26.a What are the currently used methods for measuring surgeon-specific outcomes following groin hernia repair?

KQ26.b What are the currently used methods for measuring patient-based outcomes following groin hernia repair?

There should be an internationally agreed upon set of parameters—with definitions—for groin hernia surgery.

The development of hernia registries that include patient follow-up data and account for local healthcare structures is recommended for research and audit purposes.

Chapter 27 Dissemination and Implementation

KQ27.a What are the target groups for the guidelines?

KQ27.b What are the most important messages of the guidelines, both general and specific, for the targeted groups?

KQ27.c Which channels can be used for guidelines distribution?

KQ27.d How can the guidelines be supported by Internet tools, platforms, Apps and social media?
KQ27.e What is the evaluation strategy for the implementation process?

**Recommendation** HerniaSurge recommends that all countries or regions develop a guidelines dissemination and implementation strategy. HerniaSurge offers support for this process.

Global Groin Hernia Management

Chapter 28  Inguinal Hernia Surgery in Low Resource Settings

KQ28.a What is the epidemiology of inguinal hernia in LRSs?

KQ28.b Which types of inguinal hernia repairs are currently performed in LRSs?

KQ28.c What is the recommended operation for inguinal hernias in low resource environments?

KQ28.d What are the logistical challenges for safe groin hernia repair in low resource environments?

KQ28.e Should any special precautions be taken?

KQ28.f What is the most suitable mesh?

KQ28.g What is the best way to educate surgeons in a sustainable manner in LRSs?

KQ28.h How can the internet and other technologies be used to teach physicians in LRSs?

**Statement** Due to a substantial lack of access to surgery, inguinal hernia prevalence in LRSs is unacceptably high.

**Statement** In LRSs there is a lack of basic surgical training, expertise in inguinal hernia repair techniques, and resources to safely perform mesh repair. Mainly (modified) Bassini techniques are used.

**Recommendation** LRSs should focus teaching the performance of high volume inguinal hernia repair by a standardized technique (Lichtenstein) under local anesthesia preferably using a low-cost mesh (e.g. mosquito mesh).

**Recommendation** The use of low-cost mesh (with known chemical and physical characteristics, which are comparable to commercial prosthetics) is suggested.

**Recommendation** When using a non-licensed low-cost mesh, outcome audits
at a local level are suggested.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>It is suggested that at least one dose of an appropriate prophylactic antibiotic be administered prior to inguinal hernia repair in LRSs. Whether to administer antibiotics for 24 hours or more is unknown.</th>
<th>☒ ☐ ☐ ☐</th>
<th>Weak</th>
</tr>
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<tbody>
<tr>
<td>Recommendation</td>
<td>An overarching plan to improve access to safe inguinal hernia surgery in LRSs is needed. It is suggested that this plan contain simple guidelines and a sustainability strategy which should allow implementation and maintainability, independent of international aid.</td>
<td>☒ ☐ ☐ ☐</td>
<td>Weak</td>
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