

**APPENDIX C.4 GENERAL SURGERY: INGUINAL HERNIA  
LITERATURE REVIEW**

**Western Canada Waiting List Project**

**Literature Review – General Surgery: Inguinal Hernia**

**By**

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Appendix A: Search Terms

## **1. Introduction**

This literature review summarizes recent study-based data concerning the outcomes of inguinal hernia repair, with special regard to the impact of treatment delay on clinical outcomes. This review was conducted under the auspices of the Western Canada Waiting List Project to assist the General Surgery Panel in its task of developing tools for managing surgical waiting lists. Panelists will be [were] asked to assess the extent to which the review provided meaningful assistance in this regard. [See separate report.]

This review focuses on four major questions: (1) how much suffering and disability do patients with inguinal hernia experience pre-operatively; (2) how effective are treatments for inguinal hernia in improving outcomes, including suffering, disability, and mortality rates; and (3) what impact does delay in treatment – especially surgery – have on outcomes of inguinal hernia repair and the effectiveness of its treatments; and (4) which pre-operative variables best predict the degree of benefit likely to be experienced by patients undergoing treatments for inguinal hernia repair.

## **2. Search Strategy**

A comprehensive search was completed to obtain relevant literature. The search consisted of the following:

- References were searched for with the use of the electronic databases Medline, Best Evidence, Cochrane Library, and HealthSTAR;
- Recent review articles, practice guidelines, and consensus reports were searched for on the web by professional organizations such as the American Hernia Society and the Canadian Medical Association;
- In an ancestry analysis, references were obtained from bibliographies of articles retrieved through the computerized searches;
- Informal consultation with Western Canada Waiting List Project surgical panelists was used to request more information and ask whether they knew of additional data of which we should be aware.

See Appendix A for the search terms and limitations used to retrieve citations and a list of the web sites accessed. For most terms searched electronically were limited to articles published between 1989 and 2000, written in English.

Approximately 500 citations were found from these searches. The abstracts of these citations were first screened to eliminate items not relevant to the review. Approximately 40 articles were retrieved and screened once more for relevance to the four research questions mentioned above, and 15 studies were chosen for inclusion in this report.

## **3. Condition and Treatment Description**

### **3.1 Condition**

Hernias are protrusions of peritoneal contents (primarily intestines) through abnormal openings or defects in the fascial and muscular layers designed to contain them. The most

common type of hernia is the inguinal hernia, which accounts for approximately 80 percent of all hernias. Inguinal hernias occur when a portion of the intestine protrudes into the inguinal canal, which acts as a natural passageway at the lower margin of the abdominal wall near the groin.

Inguinal hernias may affect one or both sides of the groin, and can be either congenital or acquired. Most inguinal hernias are experienced by men, in which the peritoneal sac protrudes toward, and sometimes into, the scrotum.[1]

Although anatomic abnormality is a predisposing factor that often plays a role in hernia development, an equally important cause of hernia development is the “wear and tear” of living itself. Increased intra-abdominal pressure during activity, lifting, sports or injury, may create or exacerbate a weakness in the abdominal musculature.[2]

In a femoral hernia, a portion of the intestines protrudes through the passage that is normally used by the femoral artery and vein when they pass between the abdomen and the leg. Femoral hernias are most common in obese women who have had several pregnancies.

According to Canadian Institute for Health Information statistics, 22,767 men and women were discharged from hospital in 1997-98 after undergoing inguinal/femoral hernia repair, corresponding to a crude incidence rate of 153 per 100,000 population.[3]

Hernias generally do not heal or resolve spontaneously. If they become symptomatic they require either mechanical support (e.g., truss) or surgical repair.

### **3.2 Risk factors**

Risk factors for hernias include congenital abnormalities and conditions resulting in recurrent increased intra-abdominal pressure, including chronic cough, obesity, straining during bowel movements or while urinating; pregnancy; straining to lift heavy objects; and persistent sneezing, such as that caused by allergies.[4] Altered nutritional status, cirrhosis with ascites, and long-term ambulatory peritoneal dialysis can contribute to the development of a hernia, as can certain surgical conditions and procedures, including appendectomy.[2]

Older age is also a risk factor in the development of inguinal hernia. Surgeries performed in adults are more frequently among patients aged 60 to 80 years.[5-6]

### **3.3 Symptoms and diagnosis**

Initially, an inguinal hernia may produce no symptoms, or may simply cause a feeling of heaviness in the groin (especially during long periods of standing). As the hernia grows, it eventually causes an abnormal bulge under the skin near the groin, and this bulge may become progressively more uncomfortable or painful, or tender to the touch. As the hernia increases in size, a portion of herniated intestine may become incarcerated (trapped and unable to slide back into the abdomen). If this occurs, there is danger that the trapped intestine may twist and strangulate (die because its blood supply is cut off). This causes severe abdominal pain, cramping, nausea, and vomiting and requires immediate treatment.

Hernias may be detected by patients as a bulge, or incidentally discovered on physical examination. Typically, patients will first notice a burning sensation in their groin before being able to detect the bulge. The mass is frequently less palpable in the morning, or when reclining but reappears when the patient moves into a standing position. The pain is usually localized, sharp, aggravated by change in position or straining, and relieved by cessation of the physical activity that precipitated it.

A sudden increase in the size of the mass suggests incarceration or the development of a sliding component.[7, 8] In this setting, pain becomes persistent and is often associated with systemic signs or symptoms, such as elevated temperature, tachycardia, vomiting, and abdominal distention.

About 70 percent of inguinal hernias can be identified by simple palpation. During the physical exam, the physician will look for an abnormal protrusion near the groin, and palpate the area to check for a mass. Often, the protruding hernia can be temporarily pushed back into the abdomen with careful pressure. In some cases, the physician may need to confirm the diagnosis with an ultrasound examination of the inguinal region performed in both the upright and supine positions. This test can distinguish hernia from other causes of a mass in the groin area, such as an enlarged lymph node.

### **3.4 Treatment**

Inguinal hernias are repaired surgically (herniorrhaphy) by suturing and sometimes patching the abdominal wall in a way that will permanently strengthen it. There are two techniques used to repair hernias: open surgery or laparoscopic surgery.[7]

In open herniorrhaphy, an incision is made in the skin and herniated tissue replaced into the peritoneal cavity. The hernia opening is repaired with sutures. In some cases, a small piece of synthetic mesh material is used to reinforce the area. Fibrous tissue from surrounding areas grows into the interstices of the mesh, strengthening the area. Open techniques of hernia repair can be performed under local, regional, or general anesthesia.[2, 7]

Laparoscopic herniorrhaphy begins with three or four much smaller incisions through which the surgeon inserts trocars—narrow, tube-like devices. Through one trocar, the surgeon inserts a laparoscope, which is a telescopic video camera that provides a magnified view of internal anatomical structures. Surgical instruments for cutting and gripping are inserted through the other trocars. Laparoscopy allows the surgeon to place and anchor the patch on the inside of the abdominal wall, taking advantage of the natural outward pressure of the abdomen to secure the repair and promote healing. (In contrast, the patch is placed on the outside of the abdominal wall in the traditional open operation.) Although mostly performed under general anesthesia, in certain cases, patients can be operated laparoscopically or under regional anesthesia.[1, 7]

### **3.5 Recurrence rates**

Recurrence rates have been reported between 2.3 percent (at a median follow-up of 24 months) to 11.2 percent (median follow-up of > five years).[9]

An estimated 25 percent of all hernias recur within a year of repair. Another 25 percent will recur by the fifth postoperative year. The remaining 50 percent of recurrences occur more than five years after the surgical repair.[10]

#### **4. Baseline Health Status Measures**

The primary indicator of baseline status in the studies reviewed was the Medical Outcomes Study 36-item short-form health status survey (SF-36). The SF-36 assesses eight separate domains: physical functioning (10 items); role limitations due to physical health (four items); role limitations due to emotional problems (four items); pain (two items); general health perceptions (five items); vitality (four items); social functioning (two items); emotional well-being (five items); and change in health (one item). Scoring for the SF-36 is calculated separately for each of the eight subscales, without determining a total score. Validation studies have shown that the physical and mental health scales each appropriately discriminate at least at a moderate level of disability in patient groups due to physical or psychiatric illness.[11]

Table 1 provides a summary of SF-36 scores for patients with inguinal hernia, both pre-operatively and post-operatively. In this section we focus on baseline (pre-operative) symptoms.

##### **4.1 Function**

Using the SF-36, Liem et al. acquired scores for 139 patients scheduled for open hernia surgery and 134 patients scheduled for laparoscopic hernia surgery. For the physical functioning domain, the open surgery patients scored a median of 80 out of a best score of 100 pre-operatively, and the laparoscopic group scored 85. Postoperative scores were not available.[12]

Lawrence et al. found that patients scheduled for open surgery had a mean score of 80 pre-operatively; laparoscopic patients scored 75.[13] A study by Jenkinson et al. found that open surgery patients scored a mean of 86.2 preoperatively, and laparoscopic patients scored 79.6.[14] Open surgery patients in the Wellwood study (about 400 patients) had a mean baseline score of 75 for physical function, and laparoscopic patients had a mean score of 79 out of 100.[15]

Based on these results, preoperative scores for function using the SF-36 was similar for both open and laparoscopic hernia repairs and appeared consistent across studies.

<b>Table 1. Pre- and Postoperative mean SF-36 scores</b>									
Domain	n*	Surgery Type	Baseline	6 weeks	3 months	6 months	Change	Average change	Reference
General health	140	Both	77		79	81	4		[13]
	195	Lap	74.1		79.2		5.1	3.23	[15]
	53	Lap	74.85	76.21			1.36		[14]
	195	Open	71.8		77.9		6.1	3.06	[15]
	62	Open	79.58	79.60			0.02		[14]
Emotional well-being	140	Both	79		82	84	5		[13]
	197	Lap	73.9		82.0		8.1	7.14	[15]
	57	Lap	77.12	83.30			6.18		[14]
	195	Open	74.9		81.7		6.8	5.15	[15]
	62	Open	79.16	82.65			3.49		[14]
Pain	140	Both	71		87	88	17		[13]
	197	Lap	61.5		83.4		21.9	18.32	[15]
	55	Lap	66.67	81.41			14.74		[14]
	195	Open	64.5		82.9		18.4	8.45	[15]
	64	Open	72.74	75.69			2.95		[14]
	64	Open	73			77	4	[16]	
Physical function	140	Both	83		92	94	11		[13]
	194	Lap	74.9		85.1		10.2	9.17	[15]
	56	Lap	79.64	87.77			8.13		[14]
	195	Open	79.3		85.4		6.1	4.16	[15]
	63	Open	86.19	88.41			2.22		[14]
Role limits due to emotional problems	140	Both	90		90	96	6		[13]
	192	Lap	78.3		88.3		10	10	[15]
	194	Open	80.5		87.1		6.6		[15]
	64	Open	81			86	5	[16]	
Role limits due to physical health	140	Both	74		87	94	20		[13]
	192	Lap	65.8		84.9		19.1	19.1	[15]
	194	Open	68.3		84.3		16.0		[15]
Social function	140	Both	90		94	95	5		[13]
	197	Lap	83.8		90.4		6.6	5.09	[15]
	56	Lap	88.10	91.67			3.57		[14]
	64	Open	83			89	6	5.93	[16]
	195	Open	84.0		89.9		5.9		[15]
	55	Open	91.84	85.94			5.9	[14]	
Vitality	140	Both	67		72	74	7		[13]
	197	Lap	62.2		71.8		9.6	9.6	[15]
	195	Open	64.6		72.3		7.7		[15]

## 4.2 Pain

Pain is the symptom most often reported by patients with an inguinal hernia. Pain has been measured in studies descriptively and by means of the SF-36 scale. In the SF-36 domain of

pain, both the open and laparoscopic surgery patients in the Liem et al. study scored a median of 77.[12] Preoperative scores for pain on the SF-36 from the Lawrence, Jenkinson, and Wellwood studies ranged from 64.5 to 73 for open surgery and 61.5 to 66.7 for laparoscopic repair (Table 1).[12] In a study conducted by Burney et al., 69 percent of 103 patients reported pain or discomfort related to the hernia as a dull ache or pressure sensation. Symptoms reported were rarely considered severe or disabling.[16] O’Riordan and Kingsnorth reported that 67 percent of 3,188 herniorrhaphy patients in a clinical audit reported pain before surgery.[17]

### **4.3 Other quality of life measures**

Of the other SF-36 domains, vitality had the worse score preoperatively, followed by pain, role limitations due to physical health, general health, emotional well-being, physical function, role limitations due to emotional problems and social function (Table 1).

The Liem et al. patients mentioned above scored a median 70 and 75 out of 100 (indicating best possible health) for the general health domain pre-operatively, 87 and 100 for the social functioning domain, and 80 and 84 in the mental health domains, for open surgery and laparoscopic surgery respectively. Both groups scored 100 in role limitations due to physical health and emotional problems, and both scored 70 in the vitality category.[12]

## **5. Surgical Outcomes**

Four studies used the SF-36 to measure health status before surgery (baseline) and after surgery (Table 1).[13-16] The change in score was calculated for baseline and postoperative scores at the longest follow-up point.

### **5.1 Function**

In the domain of function, a total of 648 patients scored an average of 81 postoperatively out of a best possible score of 100 on the SF-36. Average scores were 88 for 89 patients at six weeks, 88 for 529 patients at three months, and 94 for 140 patients at six months post-surgery. Patients in the two studies undergoing laparoscopic surgery had an average score of 77 prior to surgery and 86 after surgery. For open surgery in the same two studies, patients had an average preoperative score of 83, with a postoperative score of 87.[14, 15]

### **5.2 Pain**

Patients in the four studies reporting on pain (n = 715) scored an average of 68 out of 100 on the SF-36 pain domain prior to surgery. After surgery, average scores were 79 for 119 patients at six weeks, 84 for 532 patients at three months, and 83 for 204 patients at six months. For the patients having laparoscopic hernia repair, the average score prior to surgery was 64, which increased by 18 points to 82 after surgery. Patients having open surgery averaged 70 points preoperatively and 79 points postoperatively (Table 1).[13-16]

Cunningham et al. found that patients with no palpable, visible bulge preoperatively, patients with moderate or severe immediate postoperative discomfort, and patients who required a medical leave of absence from work for four or more weeks after surgery all had more long-term pain.[18]

### **5.3 Other quality of life outcomes**

Among the other six domains on the SF-36, the most significant change observed was in the area of role-physical, with an average improvement of 16 points at three months and 25 points at six months, followed by pain, and physical function. The smallest change was observed in the domain of general health, followed by social function, and emotional well-being. When change was compared by surgery type, laparoscopic hernia repair demonstrated a larger change in all domains except social function with the most notable difference in pain, physical function and role limitations due to emotional problems.

## **6. Effects of Waiting for Treatment**

### **6.1 Practice guidelines**

The natural history of hernias makes it difficult for physicians to estimate the need for surgery unless there is a concern of incarceration with strangulation. If this occurs, emergency surgery must be performed. The decision to operate is made on a case-by-case basis by the patient and the doctor. The urgency of hernia repair does not increase at a predictable rate. Generally, each patient decides for him- or herself when the hernia becomes enough of a problem to constitute a need for surgical intervention.

There have been very few standards written for the timing of hernia surgery. The clinical guideline for inguinal hernia endorsed by the Society for Surgery of the Alimentary Tract states that the majority of groin hernias can be electively referred to a surgeon within a period of weeks. However, if the hernia is tender and not reducible, the guideline indicates that the patient should be referred immediately due to the risk of strangulated bowel or other viscera..[7]

According to a review by Bax et al., almost all groin hernias should be surgically repaired. When the potential complications of incarceration and strangulation are considered against the minimal risks of hernia repair (particularly when local anesthesia is used), the early repair of groin hernias, they argue, seems clearly justified.[19]

### **6.2 Influence of delay**

There have been few studies on the effect of delay on hernia patients. One article directly assessed the effects of emergency repair of patients previously on a waiting list in comparison to three other groups: emergency patients not having been on a waiting list and the patients of two surgery firms in the U.K. receiving elective hernia surgery. Over a two-year period, 62 patients with a median age of 66 years (20-94) were admitted for emergency surgery for an inguinal hernia. These patients were compared to age and sex-matched patients undergoing elective surgery in the same period in the two general surgical firms "A" and "B" in the same hospital. Nine patients (15%) from the emergency admission group who were previously on a waiting list were found to have longer hospital stays and a much higher complication rate when compared to those not previously on a waiting list and those receiving elective hernia repair (see Table 2).[20]

	Emergency pts* on waiting list	Emergency pts* not on waiting list	Firm A	Firm B
n	9	53	62	62
Median (range) time on waiting list in months	9 (1-30)	-	6 (2-14)	7 (1-26)
Median (range) duration of hospital stay in days	16 (5-90)	7 (2-26)	4 (1-13)	4 (2-7)
Complication rate	55.6%	35.8%	3.2%	1.6%
*Pts = patients				

Trusses have been used to defer or to obviate the need for surgery. However, these can be used incorrectly, potentially encouraging scar formation, which must then be dealt with when the repair is eventually done. Scarring is associated with increased bleeding, postoperative swelling, and prolonged testicular pain, all of which can lead to worse outcomes.[8]

In a study to determine how the risk of strangulation in femoral and inguinal hernias varied in relation to duration, Gallegos et al. found the cumulative probability of strangulation at three months was 2.8 percent, at 24 months 4.5 percent, and at 60 months 8.6 percent.[21]

### **6.3 The risks of emergency surgery**

Several studies showed that an increased period of hospitalization and increased levels of morbidity and mortality often result following emergency surgery.[5, 6, 22-26] The authors frequently recommended that hernia repair be performed sooner rather than later to avoid the risk of emergency interventions.

A cohort of all patients over the age of 80 who received inguinal hernia repair in a county in Denmark during a one-year period (1990) was followed prospectively to study morbidity and mortality (n = 36). In the 15 patients who had received emergency hernia repair an independent influence was found on the development of complications (emergency compared with elective). The median hospital stay after emergency surgery was 11 days (range four - 59 days), compared with five days (two - 12 days) after elective operations. Postoperative mortality was 14 percent after emergency surgery and zero after elective surgery. The author concluded that emergency herniorrhaphy carried a high risk of complications, even in the absence of co-existing disease.[26]

In another study, Allen, et al. found that elderly elective patients stayed in the hospital a mean of 9.3 days compared to 13.2 days for emergency patients. The mortality rate for emergency patients was 6.5 percent in contrast to zero for elective surgery patients.[22] Nehme reviewed the records of 1,496 consecutive hernia patients over the age of 65 years and reported that multiple complications were seen more frequently after emergency procedures. Of 235 patients who underwent emergency operations, 131 (56 percent) suffered

a total of 310 complications, including 18 deaths. In comparison, only 26 percent of the elective group had postoperative complications.[25]

Primatesta and Goldacre found that there was a significant elevation of mortality after emergency operations and recommended that repair of inguinal hernia be undertaken soon after the diagnosis to minimize the risk of adverse outcomes.[6] McEntee et al. reported a mortality rate after strangulation of approximately 9 percent and also advocated prompt elective repair.[24] Nehme’s study showed a 7.5 percent mortality rate after emergency operations compared to 1.3 percent mortality after elective surgery.[25] In studying the risks of re-operation, Nilsson et al. found that emergency operations were not associated with relative risk of re-operation for recurrence, but postoperative mortality among emergency cases was 50 times greater than for patients operated on electively (3.5 vs. 0.07 percent).[5] Gunnarsson et al. determined that emergency surgery was the single factor that impaired short-term survival in 146 patients over the age of 75.[23] Morbidity, mortality and length of stay are summarized in Table 3 for emergency patients and in Table 4 for elective patients, in order of age group.

**Table 3: Periods of hospitalization, morbidity and mortality after emergency herniorrhaphy**

Year	Sample size	Length of Stay median days (range)	Morbidity %	Mortality %	Age	Reference
1992-94	284			6	>15	[5]
1979-87	79	9 (4-56)		9	>20	[24]
1984	48	13.2		6.5	>65	[22]
1971-80	235		56	7.7	>65	[25]
1992-95	17	5 (2-15)		6	>75	[23]
1990	15	11 (4-59)		14	>80	[26]

**Table 4: Periods of hospitalization, morbidity and mortality after elective herniorrhaphy**

Year	Sample size	Length of Stay Median days (range)	Morbidity %	Mortality %	Age	Reference
1992-94	4595			.07	>15	[5]
1984	49	9.3		0	>65	[22]
1971-80	1044		26	1.3	>65	[25]
1992-95	129	2 (1.7)		0	>75	[23]
1990	16	5 (2-12)		0	>80	[26]

## 7. Prognostic Indicators of Treatment Benefit

### 7.1 Laparoscopic vs. open surgery

Liem et al. determined that postoperative quality of life scores were better for patients having undergone laparoscopic surgery, with the most striking differences being in the SF-36 domains of physical function, role limitations-physical, bodily pain, and social function (scores not available).[12] In a study of 400 inguinal hernia patients, Wellwood et al. found that at one month post-surgery there was a greater improvement (or less deterioration) in

mean SF-36 scores over baseline in the laparoscopic group when compared to the open group on seven of eight dimensions, with five reaching significance.[15] Lawrence et al. did not find significant differences between SF-36 scores for laparoscopic and open surgery patients.[13]

## **7.2 Other prognostic indicators**

A few other prognostic indicators have been identified in the literature, but have not been widely studied. In a study of 146 patients over the age of 75 years, emergency operation, dementia, and diabetes were associated with a reduced short-term survival.[23] Burney et al. found that patients whose general health perceptions stayed the same or improved after surgery were more likely to be younger (49 vs. 56 years) and less likely to have reported chronic conditions such as congestive heart failure, arthritis, low back pain, or a history of cancer or stroke.[16] Nilsson et al. reported that patients with postoperative complications had an increased risk of re-operation. Absorbable sutures were also significantly associated with increased re-operation risk.[5] In Nehme's 1,496 consecutive hernia patients over 65, general anesthesia, and, to a lesser extent, spinal anesthesia, were associated with a higher rate of serious postoperative complications, including all postoperative deaths. Local anesthesia provoked the least amount of adverse results, despite being administered to many of the more seriously ill and oldest patients.[25]

## **8. Conclusion**

An inguinal hernia will not spontaneously heal. It may enlarge and cause increased discomfort and disability until it is repaired. Unrepaired hernias can cause bowel obstruction or strangulation. The risks of delaying surgery can be considerable, with the most important concern being the chance of incarceration with strangulation. If this occurs, emergency surgery must be performed.

The urgency of hernia repair does not increase at a predictable rate. Clinical guidelines for inguinal hernia generally state that the majority of groin hernias can be electively referred to a surgeon within a period of weeks. However, if the hernia is tender and not reducible, guidelines indicate that the patient should be referred immediately due to the risk of strangulated bowel or other viscera. Although not widely studied, delay of surgery has been shown to increase the incidence of emergency herniorrhaphy with longer hospital stay, more complications and a higher mortality rate compared to those who undergo surgery electively.

Herniorrhaphy in adults improved the patients' ability to take part in physical roles, followed by improvements in relief from pain and physical function. Laparoscopic surgery was found to produce a greater improvement in quality of life than open surgery, with a lower rate of recurrence. Other factors which were found to improve outcome were younger age, better health, and local anesthesia. Factors reported to negatively affect outcome included emergency surgery, postoperative complications, general anesthesia, dementia, diabetes, and chronic conditions such as congestive heart failure, arthritis, low back pain, or a history of cancer or stroke.

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## Inguinal Hernia Literature Review Appendix A: Search Terms

Relevant literature was obtained through electronic database searches of Medline, Best Evidence and Cochrane Library. The following search terms and limitations were used to retrieve citations.

### Medline:

The Medline search was limited to articles published between 1989 and 2000 (unless otherwise noted). Articles were included if they were written in English, or had an English abstract. The subject headings below were combined with hernia, inguinal\* using an “and” connector.

The majority of terms were “exploded” to include all narrower terms. When exploded searches yielded a more than a hundred articles, the strategy was modified to “focus” the search to limit the search to those articles in which the subject heading is considered the major point of the article. In the list of search terms an asterisk refers to a focused search whereas “exp.” refers to an exploded strategy. For example “evaluation studies\* or (exp. 1999-2000)” refers to the focused search for age factors for the years 1989-2000, combined with (or) an exploded search of age factors for the years 1999-2000.

- Absenteeism
- Activities of daily living
- Age factors
- Aging
- Cost-benefit analysis
- Cost control
- Cost savings
- “Costs and cost analysis”\*
- Decision making
- Decision support techniques
- “Delay\$”
- Delivery of health care\*
- Disability evaluation
- Disease progression
- Employment
- Evaluation studies (1999-2000)
- Health care costs
- Health planning
- Health status
- Health status indicators
- Jurisprudence
- Liability, legal
- Life expectancy
- Malpractice
- Models, theoretical
- Mortality
- Multivariate analysis
- “Outcome and process assessment (health care)”\* or (exp. 1999-2000)
- “Outcome assessment (health care)”\* or (exp. 1999-2000)
- Pain\* (1997-2000)
- Pain measurement
- Patient acceptance of healthcare
- Patient satisfaction
- Patient selection
- Policy making
- Practice guidelines
- Predictive value of tests
- Preoperative care
- Quality of life
- Questionnaires
- “Referral and consultation”
- Reoperation\* or (exp.1999-2000)
- Risk factors (exp.1997-2000)
- Severity of illness index
- Sex factors
- Sick leave
- Socioeconomic factors
- Surgical procedures, elective
- Surgical procedures, operative (economics, standards, statistics & numerical data, trends, utilization, mortality)\*

- Survival analysis
- Survival rate
- Time factors (1998-2000)
- Treatment failure
- Treatment outcome\* or (exp. 1999-2000)
- Waiting lists
- Work capacity evaluation

**Best Evidence:**

Records from 1991 to issue 4/1999 were searched using the following terms:

- Hernia
- Waiting lists
- Rationing

**Cochrane Systematic Reviews:**

Issue 4/1999 was searched using the following terms:

- Hernia
- Waiting lists
- Rationing

**HealthSTAR:**

The records from 1975 to January, 2000 were searched using the following terms:

- “Delay\$”
- Health care rationing
- Health priorities
- Hernia
- Hernia, inguinal
- “Prioritisation”
- “Prioritization”
- Surgery
- Time factors
- Waiting Lists

## Websites

Medical Education Collaborative, Inguinal Hernia: Anatomy and Management <a href="http://www.medscape.com/Medscape/surgery/ClinicalMgmt/CM.v01/public/index-CM.v01.html">www.medscape.com/Medscape/surgery/ClinicalMgmt/CM.v01/public/index-CM.v01.html</a>
Society for Surgery of the Alimentary Tract: Patient Care Guidelines 2000, Surgical Repair of Groin Hernias <a href="http://www.ssat.com//guidelines/hernia6.htm">http://www.ssat.com//guidelines/hernia6.htm</a>
American Medical Association, The Causes and Surgical Treatment of Abdominal Hernia <a href="http://www.ama-assn.org/insight/spec_con/hernia/hernia.htm">www.ama-assn.org/insight/spec_con/hernia/hernia.htm</a>
Discovery.com, Inguinal Hernia <a href="http://www.discoveryhealth.com/dh/ihth/wsdsc000/20726/10200.html">www.discoveryhealth.com/dh/ihth/wsdsc000/20726/10200.html</a>

In addition, the websites of the following organizations were searched for additional information, particularly for guidelines or consensus documents related to hernia surgery:

- American College of Surgeons
- American Hernia Society
- British Columbia Council on Clinical Practice Guidelines
- Canadian Medical Association
- CPG Infobase
- European Association of Surgical Sciences
- European Hernia Society
- Health Canada
- International Society of Surgery
- National Institute of Diabetes and Digestive and Kidney Diseases
- National Institutes of Health
- Scottish Intercollegiate Guidelines Network
- Society of Laparoscopic Surgeons

