University of Cape Town

Department of Surgery

WHAT IS THE CURRENT PRACTICE OF INGUINAL HERNIA REPAIR AT UNIVERSITY OF CAPE TOWN AFFILIATED HOSPITALS?

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SCTEAR001

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Declaration

I, **Earl Scout**, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Signature:

Signed by candidate

Date: 07 December 2019
Acknowledgements

To my supervisor: Dr JC Kloppers, for his encouragement, mentorship and guidance.

To my parents: Evelyn and Christopher, for giving me a start on this journey.

To my family: Judith, Jared and Eliana, for graciously giving so much of what should be yours, to allow me to do this. I am in your debt.
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Literature Review

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### Abbreviations

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<tr>
<td>UCT</td>
<td>University of Cape Town</td>
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<tr>
<td>HIC</td>
<td>high-income countries</td>
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<td>LMIC</td>
<td>lower- and middle-income countries</td>
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<tr>
<td>DALY</td>
<td>disability-adjusted life-year</td>
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<td>NHS</td>
<td>National Health Service</td>
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<tr>
<td>BMI</td>
<td>body mass index</td>
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<tr>
<td>TAPP</td>
<td>trans-abdominal pre-peritoneal laparoscopic repair</td>
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<tr>
<td>TEP</td>
<td>total extraperitoneal laparoscopic repair</td>
</tr>
<tr>
<td>RCS</td>
<td>Royal College of Surgeons</td>
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<tr>
<td>GSH</td>
<td>Groote Schuur Hospital</td>
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<td>MPH</td>
<td>Mitchell’s Plain Hospital</td>
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<td>VHW</td>
<td>Victoria Hospital Wynberg</td>
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<tr>
<td>NSH</td>
<td>New Somerset Hospital</td>
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</tbody>
</table>
Structured Literature Review

Literature search strategy

A structured literature review was performed searching the electronic databases of Pubmed and Google Scholar using the search thread (groin hernia history) OR (groin hernia repair) OR (groin hernia repair training) OR (groin hernia South Africa). Additional manual searches of the Cochrane Library were also performed. References were crosschecked. Only human studies in English were included.

Objectives of Literature review

This literature review aims to describe the evolution in the understanding and techniques of repair of groin hernias, and the required training involved. It also aims to see what exists in the literature with regards to the South African perspective.

History and Definition

Hernias have been a condition plaguing mankind from the dawn of time. The name is derived from the Greek word ‘hernios’ meaning offshoot or bud, and the formal definition in Stedman’s medical dictionary is a "protrusion of a part or structure, through the tissues normally containing it". In the case of inguinal hernias, this protrusion occurs in the groin at the so-called ‘inguinal region’. The earliest recordings of a hernia date back to around 1550 BC, and are found in the Egyptian *Papyrus of Ebers*, where a bulge in the groin caused by coughing was described. The mummy of Pharaoh Ramses V, circa 1157 BC, also had a clear hernia in the groin, and hernias were further memorialised in ancient Greek statuettes from the 8th and 9th centuries BC [1,2].
Epidemiology of groin hernias

Hernias are a very common problem, with a lifetime occurrence quoted in the literature for high-income countries (HIC’s) of 27-43% in males and 3-6% in females [3]. The picture in lower- and middle-income countries (LMIC’s) is quite different though, although exactly how different has been difficult to quantify. Some studies from Africa have shown that the prevalence can range greatly, from 7.7% to > 30% in the general population, with one study from a district in Ghana showing a prevalence of 1,400 hernias per 100,000 people, or 2.7% of the adult male population. This is much higher than in HIC’s where the rate is more typically 150-200 hernias per 100,000 people [4].

The prevalence of hernias has a great economic impact. In HIC’s, a return to function is an important marker of successful hernia management, but in LMIC’s, this economic impact is especially pronounced. As hernias occur more in males, in LMIC’s where work is typically more physical and demanding, this leads to a major limitation of professional activity and productivity. Due to the limited options for having time off work, and difficulties in accessing health care, hernias often go untreated for long periods. Patients are much more likely to present with hernias as emergencies, due to obstruction or strangulation [5]. Subsequently, the morbidity and mortality associated with hernias in LMIC’s is considerably higher, and Africa has the highest per capita surgical disability-adjusted life-years (DALYs), the loss of the equivalent of one year overall health [6].

A large proportion of the global burden of disease can be surgically treated, with the Lancet Commission on Global Surgery putting this figure at 28-32% [7]. As hernias are so common and surgery is the only cure, it would follow that surgical hernia repair has become one of the most commonly performed general surgical operations, with more than 20 million procedures performed annually [3]. There exists a large variation in the rates of repair between the HIC’s, and LMIC’s though, with figures for the USA in 2003 showing 275 procedures per 100,000 inhabitants per year, Europe with 100-180 per 100,000, while in sub-Saharan Africa the rate can be as low as 30 per 100,000 inhabitants per year [8]. Due to the large volume of procedures being performed, hernia surgery also forms a large part of health care expenditure, with the costs in the USA in 2005 for hernia surgery amounting to more than
$48\ \text{billion}^{[9]}$, and the National Health Service (NHS) in the England spending more than £130 million annually on elective hernia surgery$^{[10]}$.

**Anatomy of the groin**

To fully understand inguinal hernias and the complexities of repair, one needs to have a firm grasp of the anatomy of the groin. Where it was first thought that hernias resulted due to a rupture of the peritoneum, in the 18$^{\text{th}}$ and 19$^{\text{th}}$ centuries following the renaissance, the so-called anatomical era occurred, where knowledge and understanding of the inguinal region and the mechanism of herniation increased dramatically through autopsy and anatomical dissection$^{[11]}$.

The inguinal canal exists as a passage that transported the gonads that are formed intra-abdominally embryologically, to their definitive position in the contractile scrotum outside the body, where they are housed for constant temperature maintenance and thereby optimal spermatogenesis. The canal can be described conceptually as being rectangular. The anterior wall is made up of the external oblique aponeurosis medially and fibres of internal oblique muscle laterally. The floor made up of the inguinal ligament, while the roof consisting of the arching fibres of the internal oblique and transverse abdominus muscles laterally, and the conjoint tendon medially. The posterior wall consisting of the transversalis fascia. The canal extends from a defect in the transversalis fascia laterally at the deep ring, and ends at the superficial ring medially, where the fibres of the external oblique aponeurosis splay to form an opening. In males, it transmits the spermatic cord with its contents, while in females it carries the round ligament (Fig. 1).
In 1956 Dr Henri Fruchaud developed the concept of the myopectineal orifice. It extends from the lateral edge of the rectus medially, to the iliopsoas muscle laterally, and is bounded superiorly by the arching fibres of internal and transverse abdominus, and inferiorly by Cooper’s ligament. This area is weaker because of the aponeurotic nature of the tissue found here, as well as containing natural defects for the transmission of structures from the abdomen to the lower extremities and pelvis \([12]\). The transversalis fascia’s inability to prevent abdominal contents protruding through these defects, is the common factor in the evolution of all groin hernias (Fig. 2).

Figure 1. Anatomy of the inguinal canal (viewed from anterior). Available at: https://step1.medbullets.com/gastrointestinal/110018/inguinal-canal (accessed 07 December 2019)
Risk factors for groin hernia

There has long been thought as to what exactly causes a hernia, and the answers are still not absolutely clear. A number of risk factors have however been established, which can be divided into patient and external factors. The risk for herniation increases with age, and there exists a genetic and gender predisposition, with males more likely to be affected. A patent processus vaginalis also puts one at increased risk, as does connective tissue disorders or alterations, such as abnormal collagen type 1:3 ratios. Contrary to what one might expect, having a low body mass index (BMI) increases your risk of herniation in the groin, while being overweight, serves to be protective.\(^{13}\)

History and development of repair techniques

The management of groin hernias has changed dramatically over time. Hammurabi of Babylon in 1700 BC described reducing the hernia and applying tight bandages to prevent protrusion. It is unclear if surgery for hernias was performed at this early stage, but the first real description of incisions for the management of hernias dates back to between 50-200
AD. Surgery at this stage was very rudimentary, and typically involved making a scrotal incision, excising and ligating the hernia sac, removing the spermatic cord and testicle, and leaving the wound open to heal by secondary intention. As could be expected, this resulted in significant morbidity and mortality, and subsequently, procedures were only carried out for severe pain or strangulation, with treatment with compressive devices being preferred. The management and outcomes remained mainly unchanged through to the dark Middle ages, but with the Renaissance came a new dawn of knowledge and enlightenment driven by a greater understanding of anatomy. Despite the advances in technique and understanding though, recurrence rates remained high [2].

The late 19th and early 20th century can be described as the dawn of the modern era of hernia surgery. This was greatly aided by the introduction of anaesthesia and aseptic techniques, by people like Lister and Halsted. A breakthrough was made by Edoardo Bassini in the late 1880’s, when he instituted the principle of restoring the integrity of the posterior wall of the inguinal canal and tightening the deep ring, along with high ligation of the sac. This was achieved by suturing the conjoint tendon, internal oblique muscle, and transversalis fascia, to the inguinal ligament in three layers. Bassini stated, ‘in order to achieve a radical cure of hernia it is absolutely essential to restore those conditions in the area of the hernial orifice, which exist under normal conditions’ [14]. The technique he described changed the way hernias were managed and led to a drastic reduction in morbidity and mortality. The repair was performed under tension though, and while there were major improvements in outcomes with regards sepsis and mortality, pain and recurrence remained high.

There were various modifications to the technique described by Bassini in an attempt to decrease recurrence. Dr Edward Earle Shouldice described a technique in the 1950’s that brought recurrence down to < 1%. This was built on the principles of local anaesthetic, technical aspects of the repair, and early ambulation. To achieve these results, the technique which involves opening the posterior wall and performing a double-breasted repair with 4 suture lines, requires meticulous attention to detail and often practitioners have to spend time at the Shouldice Hospital in Canada to master the technique [15].
An understanding was reached that one of the main reasons for pain and recurrence, was due to tension on the pubic end of the repair. In an attempt to solve this problem, people tried using foreign material in the repair, like animal sinew or tried repair with graft or pedicles of aponeurosis or tendon. Theodore Billroth had already stated in the 19th century that, ‘if we could artificially produce tissues of the density and toughness of fascia or tendon, the secret of radical cure of hernia would be discovered’ [14]. The discovery by Carothers of synthetic polymers with the subsequent introduction of synthetic mesh in the 1930’s and 1940’s, brought about this change. The next big breakthrough in hernia management was thus realised, that of repair without tension. The idea was that a synthetic mesh could be used to repair deficient tissue, without needing to tightly pull the tissues together.

The question of where best to place the mesh also brought about debate. The concept of using the pre-peritoneal space for repair was first proposed by pioneers like Annandale and Cheatle around the turn of the 20th century, but that plane for repair was popularised by Nyhus and Stoppa, when they used synthetic mesh to buttress the posterior wall from behind. Dr Irving Lichtenstein is credited as bringing the tensionless mesh repair into everyday use. He reported his technique in 1989, placing the mesh on the anterior surface of the posterior wall and suturing it to the inguinal ligament. Laterally the mesh is slit, and the two tails are overlapped and sutured to the inguinal ligament to reinforce the deep ring [16]. Lichtenstein’s repair took off exponentially because of its simplicity and ease of reproducibility, along with the fact that infection and recurrence were negligible.

Until the late 20th century, all inguinal hernias were being repaired by open operation. With the advent of minimally invasive surgery and all the benefits it confers, laparoscopic methods were also developed to repair inguinal hernias. Ger in 1982 was the first to report closing the neck of the hernia laparoscopically [17]. As the technique has developed, the principles of repair have also been more closely adhered to. The reduction of the hernia sac and the mesh are now primarily placed in the pre-peritoneal plane. Two techniques are used most commonly, the transabdominal pre-peritoneal repair (TAPP) or the total extraperitoneal repair (TEP), the latter avoiding the need to enter the abdomen [18]. Most recently, robotic repair of inguinal hernia has also been introduced, but this has not yet gained popularity due to prohibitive costs, lack of access for training and treatment, and a very steep learning curve.
Training in groin hernia repair

Training is required to acquire any new skill and with this, a learning curve occurs, defined as the time and effort necessary to achieve proficiency. It is a fact that outcomes improve along with proficiency. For inguinal hernias, while many may think that a tissue repair is easy to perform, and feasible, little published data exists about the learning curve attached. One of the major drawbacks of the Bassini technique was that while it introduced a fundamental principle of posterior wall repair, due to its many modifications, only a few surgeons performed the procedure as was described, and recurrence rates remained high. The Shouldice technique requires extensive training to achieve proficiency, with surgeons being supervised for the first 300 cases at the Shouldice Hospital, to achieve recurrence rates of 0.6 – 1.4%, where in general practice, Shouldice repairs have reported recurrence rates of 3.6% [19]. One of the factors that make the Lichtenstein tension-free technique so popular is the reported ease with which the procedure can be learned, along with its good outcomes and low recurrence rate of < 1%. Around 60 cases are reportedly needed to attain proficiency [20].

The advent of laparoscopic techniques focused attention on the learning curve associated with surgical procedures. The current evidence suggests that to be proficient in laparoscopic inguinal hernia repair techniques, this learning curve is rather steep, with trainees requiring between 100 - 200 cases to achieve independent competence [21-23]. One study, however, stated that only 30 – 40 cases were required to achieve competence [18], and this shortened learning curve may be in part explained by trainees now being more proficient at minimal access surgery in general, due to it now being the gold standard approach for common procedures like cholecystectomy and appendicectomy, and the increased use of simulators in training. Be that as it may, it is shown that the training required to achieve competence needs to be structured with a goal-directed curriculum and validated assessment tools [24], supervised by a mentor, and started fairly early in the surgical training program [25,26].

Guidelines

The fact that so many different repair options exist suggest that there isn’t a “single best method”, and that the modern general surgeon needs to be well versed in several different techniques, to best individualise patient treatment. Despite these various options, a few
recommendations have however come to the fore. It is now generally accepted that all hernias should be repaired with mesh, as the difference in recurrence rates between mesh and tissue repair by the Shouldice technique in general practice is 0.8% vs 3.6% \cite{19}, and that the ideal position for mesh is in the pre-peritoneal space, as this offers the most physiological support, covering the entire myopectineal orifice.

Various hernia societies have produced guidelines to try to direct practice, but there exist differing strengths for which they recommend laparoscopic repair, highlighting that there still exists contentiousness around this approach. The current international HerniaSurge guidelines recommend that a laparoscopic inguinal hernia repair be the procedure of choice for primary unilateral and bilateral hernias, as they are associated with less pain, numbness, and haematoma formation, and provide a quicker return to full function and work. Laparoscopic repairs are also recommended for recurrences, where the primary repair was an open one, as well as for all femoral hernias, and all females with groin hernias. These recommendations are however made with the proviso that the surgeon has specific expertise, and that sufficient resources are available \cite{20}. The evidence shows that there is no significant difference in complication rates between open and minimally invasive hernia repair techniques, when the surgeon has performed > 250 minimally invasive cases \cite{27}, but that the surgeon also has better outcomes when high annual volumes are maintained \cite{28}. Laparoscopic repair is however associated with the chance of life-threatening vascular or visceral injuries, though this risk is very small \cite{29}. Open repair maintains the benefit that it is more easily learned, is associated with less costs, and can be performed under local anaesthetic, making it an attractive option for day case surgery, and for sicker patients who are unsuitable for general anaesthetic \cite{18}.

**South African perspective**

Very limited data exists as to what the burden of inguinal hernia surgery is in South Africa, with even less known about our laparoscopic experience. One study from a regional level hospital in South Africa over a four year period showed that inguinal hernias accounted for 21.8% of elective admissions, and 3.7% of emergency admissions \cite{30}, while another study from a tertiary level South African hospital over a three year period showed that inguinal hernia repair was the second most commonly performed procedure in its Acute Care and
General Surgery Unit, accounting for 11.2% of all procedures performed \[^{[31]}\]. In England, the Royal College of Surgeons (RCS) have developed some quality standards, which state that > 40% of hernias in females, as well as those that are bilateral or recurrent, should be repaired laparoscopically \[^{[32]}\].

South Africa faces a very unique problem in that its society comprises a mix of both high and low-income, with the surgeon required to straddle this divide in practice. In weighing up the best management strategy for each patient, one has to weigh up cost (i.e. open surgery, where consumables are cheaper), vs socio-economic factors, like improved functionality and quicker return to work and being economically active (i.e. laparoscopic surgery better) \[^{[25]}\]. The guidelines of the Hernia Interest Group of South Africa, therefore, recommend three operations that they suggest general surgeons in South Africa should be equally proficient in performing, those being the laparoscopic inguinal hernia repair as the procedure of choice, the Lichtenstein tension-free technique as the preferred method for open repairs, and the Shouldice technique for tissue repairs, where gangrenous bowel is present or a bowel resection is performed \[^{[33]}\]. To achieve these ideals, South African surgeons need to be appropriately trained to attain acceptable outcomes.

**Objectives of study**

The objective of this study is to quantify the current practice of inguinal hernia surgery in hospitals in South Africa affiliated to the University of Cape Town, one of the South Africa Surgical Specialist training institutions, and to assess trainee exposure to laparoscopic repair technique.
References


What is the current practice of inguinal hernia repair at University of Cape Town affiliated hospitals?

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Abstract

What is the current practice of inguinal hernia repair at University of Cape Town affiliated hospitals?

Background: Various inguinal hernia repair techniques exist, without one ‘single best’ option. Hernia society guidelines recommend laparoscopic repair as one of its mainstays, provided surgeons are adequately trained. The current practice for hernia repair in South Africa as well as the surgical resident exposure to laparoscopic repair training is unknown.

Aim: To quantify the current practice of inguinal hernia surgery in hospitals affiliated to the University of Cape Town (UCT) and to assess trainee exposure to laparoscopic repair.

Methods: All adult patients who underwent inguinal hernia repair during the 12-month study period, at the four UCT affiliated hospitals (Groote Schuur, Mitchell’s Plain, Victoria and New Somerset) were included. Collected data parameters included age, gender, primary or recurrent hernia, uni- or bilaterality, primary surgeon consultant or non-consultant, operative time, and open or laparoscopic technique used.

Results: 380 patients were included. Eighty-eight (23.2%) repairs were performed laparoscopically, of which 5 (5.7%) were converted to open. Non-consultants were present at 70/88 (79.5%) cases performed laparoscopically and were primary surgeon at 15 (17%). Laparoscopic repair was performed for 63.6% of bilateral versus 19.3% of unilateral hernias, 39.3% of recurrent hernias and 45% of hernias in females.

Conclusion: Inguinal hernias in our setting are predominantly repaired by open surgery. The likelihood of laparoscopic repair varies significantly depending on which hospital the patient is referred to. Non-consultants have limited exposure to performing laparoscopic hernia repairs as the primary surgeon.
**Introduction**

Hernias are a very common problem, with a lifetime occurrence quoted in the literature for high-income countries (HIC’s) of 27-43% in males and 3-6% in females \[^1\]. The picture in lower- and middle-income countries (LMIC’s) is different, although exactly how different has been difficult to quantify. Studies from Africa have shown that the prevalence can range greatly, with one study from Ghana showing a prevalence of 1,400 hernias per 100,000 people, or 2.7% of the adult male population, much higher than in HIC’s where the rate is more typically 150-200 hernias per 100,000 people \[^2\]. As hernias are so common and surgery is the only cure, it would follow that surgical hernia repair has become one of the most commonly performed general surgical operations, with more than 20 million procedures performed annually \[^1\]. Different repair options exist, and there isn’t a “single best method”, so the modern general surgeon needs to be well versed in several different techniques, to best individualise patient treatment.

Various hernia societies have tried to provide some guidance, with the current international HerniaSurge guidelines recommending that a laparoscopic inguinal hernia repair be the procedure of choice for primary unilateral and bilateral hernias, for recurrences where the primary repair was an open one, as well as for all femoral hernias, and all females with groin hernias. These recommendations are made with the proviso that the surgeon has the required expertise \[^3\].

Very limited data exists as to what the burden of inguinal hernia surgery is in South Africa, with even less known about our laparoscopic experience. The guidelines of the Hernia Interest Group of South Africa recommend three operations that the general surgeon in South Africa should be equally proficient in performing, those being the laparoscopic inguinal hernia repair as the procedure of choice, the Lichtenstein tension-free technique as the preferred method for open repairs, and the Shouldice technique for tissue repairs, where gangrenous bowel is present or a bowel resection is performed \[^4\]. To achieve this, South African surgeons need to be appropriately trained to attain acceptable outcomes.
The objective of this study is to quantify the current practice of inguinal hernia surgery in hospitals in South Africa affiliated to the University of Cape Town (UCT), a surgical specialist training institutions, and to assess trainee exposure to laparoscopic repair technique.

Methods

This study was conducted over a 12-month study period from 1st January to 31st December 2017. All adult patients (aged 18 years and above) who underwent an inguinal hernia repair in any of the four University of Cape Town (UCT) affiliated public hospitals who perform inguinal hernia repairs during this study period were included. This included the Acute Care Surgery Unit at Groote Schuur Hospital (GSH), Mitchell’s Plain Hospital (MPH), Victoria Hospital Wynberg (VHW) and New Somerset Hospital (NSH). GSH, NSH and MPH surgical departments all have established operative databases and data about the study participants was retrieved from these databases. VHW does not have an established database and thus surgical theatre logs were used to retrieve the relevant data needed.

Collected data parameters included patient demographics (age and gender), hernia characteristics such as whether the hernia was a primary or recurrent hernia and whether it was unilateral or bilateral. Data collected on the hernia repair surgery included whether the primary surgeon was a consultant or a non-consultant (i.e. surgical specialist trainee or medical officer) surgeon, the length of operative time, and whether the case was done with an open or laparoscopic technique. All collected data were entered onto a Microsoft Excel© spreadsheet and analysed with basic statistical methods available in Excel. Data was mainly used for simple descriptive purposes. However, comparisons were made between males and females, the consultant and non-consultant primary surgeon groups and laparoscopic repairs were compared to open repairs. Inferential statistics for categorical data included Chi-squared test and Fischer’s exact test (for expected values <5) and student’s t-test for normally distributed numerical data. A probability value (p-value) of <0.05 was considered statistically significant. This study was formally reviewed and approved by the University of Cape Town Human Research Ethics Committee (HREC REF: 390/2018).
**Results**

During the 12-month study period, a total of 380 adult patients underwent inguinal hernia repair in the four UCT-affiliated hospitals and were included in the study. This equates to an average of 31.7 hernia repairs per month (just over one repair per day). Of these, 360 were male (94.7%) and only 20 patients were female (5.3%). The mean age for this study was 54.1 years (range 18 – 89 years). The hernia repair distribution across the 4 hospitals was as follows: GSH 100 patients (26.3%), VHW 97 patients (25.5%), NSH 95 patients (25%), and MPH 88 patients (23.2%) (Fig. 1). The majority of cases were done electively (total 319 [83.9%]) while 61 cases (16.1%) were done as emergency cases. Thirty-three patients (8.7%) had bilateral hernias, while the remaining 347 patients (91.3%) had unilateral hernias. In 347 patients (91.3%) the hernia was primary, while in 33 patients (8.7%) the hernia was a recurrence. Hernia repair was done by a consultant as the primary surgeon in 126 (33.2%) cases while the remaining 254 cases (66.8%) had a non-consultant as the primary surgeon. The mean operative hernia repair time in this series was 67 ± 27.3 minutes (range 20 – 180 minutes, IQR 45-80). Female patients needed an emergency hernia repair in four cases (20%). When comparing this to male patients there was no statistically significant difference between the two with males needing an emergency repair in 57 cases (15.8%) (p-value: 0.621).
Inguinal Hernia Repairs Per Hospital

Figure 1. Hernia repairs per hospital. GSH = Groote Schuur Hospital; VHW = Victoria Hospital Wynberg; NSH = New Somerset Hospital; MPH = Mitchell’s Plain Hospital

Consultant vs Non-Consultant

Of the total 380 hernia repairs, the majority (66.8%) were done by a non-consultant as the primary surgeon. In 43 (16.9%) of these cases where the primary surgeon was a non-consultant, a consultant was present in theatre as the assistant. Thus, of the total 380 hernia repairs, more than half (211 cases [55.5%]) were done with no consultant present in theatre. Non-consultants operating as the primary surgeon only started 15 cases (5.9%) laparoscopically, with 7 of these done at GSH, 6 done at NSH and one case each done laparoscopically by a non-consultant at MPH and VHW respectively.
Patients who underwent a hernia repair with a consultant as the primary surgeon were on average four years older than patients who underwent hernia repair by a non-consultant as the primary surgeon. There was no difference in gender between the patients done by a consultant versus those done by a non-consultant as a primary surgeon. Consultants as the primary surgeon were more likely than non-consultants to do the hernia repair laparoscopically and to do bilateral or recurrent hernias. Consultants were more likely to do elective hernia repairs than non-consultants and less likely to do emergency repairs than non-consultant surgeons. There was no significant difference in the operative times when repairs were done by a consultant vs a non-consultant as the primary surgeon (Table 1).

<table>
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<th>Non-Consultant (n = 254)</th>
<th>p-value</th>
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<td>53 (18 – 89) years</td>
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<td>Gender</td>
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<td></td>
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<td>Male Patient</td>
<td>118 (93.7%)</td>
<td>242 (95.3%)</td>
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<td>Female Patient</td>
<td>8 (6.3%)</td>
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<td>Emergency Repair</td>
<td>6 (4.8%)</td>
<td>55 (21.6%)</td>
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<td>Surgical Access</td>
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<tr>
<td>Open Repair</td>
<td>53 (42.1%)</td>
<td>239 (94.1%)</td>
<td></td>
</tr>
<tr>
<td>Laparoscopic Repair</td>
<td>73 (57.9%)</td>
<td>15 (5.9%)</td>
<td></td>
</tr>
<tr>
<td>Hernia Laterality</td>
<td></td>
<td></td>
<td><strong>0.0004</strong></td>
</tr>
<tr>
<td>Unilateral Repair</td>
<td>106 (84.1%)</td>
<td>241 (94.9%)</td>
<td></td>
</tr>
<tr>
<td>Bilateral Repair</td>
<td>20 (15.9%)</td>
<td>13 (5.1%)</td>
<td></td>
</tr>
<tr>
<td>Primary vs Recurrent</td>
<td></td>
<td></td>
<td>0.0191</td>
</tr>
<tr>
<td>Primary Repair</td>
<td>109 (86.5%)</td>
<td>238 (93.7%)</td>
<td></td>
</tr>
<tr>
<td>Recurrent Repair</td>
<td>17 (13.5%)</td>
<td>16 (6.3%)</td>
<td></td>
</tr>
<tr>
<td>Operative Time (Range)</td>
<td>70 (25 – 150) minutes</td>
<td>66 (20 – 180) minutes</td>
<td><strong>0.0884</strong></td>
</tr>
</tbody>
</table>

**Table 1.** Comparison of hernia repair performed by consultant and non-consultant as the primary surgeon. (Statistically significant p-values highlighted in bold.)
Laparoscopic vs Open Repair

Of the total 380 hernia repairs, 88 (23.2%) were selected for laparoscopic repair and 292 (76.8%) were repaired via open surgery. In the total of 88 cases started laparoscopically, 5 had to be converted to an open repair, equating to a conversion rate of 5.7%. In the group of laparoscopic cases (including cases started laparoscopically and converted to an open repair) the vast majority (85 cases [96.6%]) were elective cases, with only 3 cases (3.4%) done as emergency laparoscopic cases. When looking at the distribution of laparoscopic cases across the 4 hospitals included in the study these cases were performed more commonly at Groote Schuur Hospital (GSH) and New Somerset Hospital (NSH) compared to Mitchell’s Plain Hospital (MPH) and Victoria Hospital Wynberg (VHW). Of the total 88 laparoscopic cases 39 (44.3%) were done at GSH, 33 (37.5%) were done at NSH, 11 (12.5%) were done at VHW and only 5 cases (5.7%) were done at MPH (Fig. 1).

When comparing cases started laparoscopically to those done as an open procedure, it is evident that laparoscopic cases were statistically significantly more likely to be done by a consultant as the primary surgeon, and more likely to be done in bilateral or recurrent hernias or female patients when compared to open repairs. During the 1-year study period, only 15 hernia repairs were done laparoscopically by non-consultants as the primary surgeons across all four hospitals. Non-consultants were present at 70 laparoscopic cases (79.5%), the other times both the primary surgeon and assistant were consultants. In only one case done laparoscopically, were both the primary surgeon and assistant non-consultants, meaning that of the 88 cases done laparoscopically, 87 (98.9%) had a consultant present in theatre. Laparoscopy was less likely to be used for emergency repairs compared to open repairs. There was no significant difference in the mean age of patients having laparoscopic vs open hernia repair and no difference in the operative time between laparoscopic and open repair (Table 2).
Table 2. Comparison of cases started laparoscopically versus open inguinal hernia repairs. (Statistically significant p-values highlighted in bold.)

<table>
<thead>
<tr>
<th></th>
<th>Laparoscopic (n = 88)</th>
<th>Open (n = 292)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age (Range)</td>
<td>56 (19 – 85) years</td>
<td>54 (18 – 89) years</td>
<td>0.1553</td>
</tr>
<tr>
<td>Primary Surgeon</td>
<td></td>
<td></td>
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<tr>
<td>Non-Consultant Consultant</td>
<td>15 (17.0%)</td>
<td>239 (81.8%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>73 (83.0%)</td>
<td>53 (18.2%)</td>
<td></td>
</tr>
<tr>
<td>Primary vs Recurrent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Hernia</td>
<td>75 (85.2%)</td>
<td>272 (93.2%)</td>
<td>0.02068</td>
</tr>
<tr>
<td>Recurrent Hernia</td>
<td>13 (14.8%)</td>
<td>20 (6.8%)</td>
<td></td>
</tr>
<tr>
<td>Hernia Laterality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unilateral Hernia</td>
<td>67 (76.1%)</td>
<td>280 (95.9%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Bilateral Hernia</td>
<td>21 (23.9%)</td>
<td>12 (4.1%)</td>
<td></td>
</tr>
<tr>
<td>Elective vs Emergency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective Repair</td>
<td>85 (96.6%)</td>
<td>234 (80.1%)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Emergency Repair</td>
<td>3 (3.4%)</td>
<td>58 (19.9%)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Patient</td>
<td>79 (89.8%)</td>
<td>281 (96.2%)</td>
<td>0.0268</td>
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<tr>
<td>Female Patient</td>
<td>9 (10.2%)</td>
<td>11 (3.8%)</td>
<td></td>
</tr>
<tr>
<td>Operative Time (Range)</td>
<td>69 (30 – 140) minutes</td>
<td>66 (20 – 180) minutes</td>
<td>0.1808</td>
</tr>
</tbody>
</table>

Discussion

In this study examining the current practice of inguinal hernia repair across all hospitals affiliated to UCT, we found that 380 operations were performed in the four hospitals over the 12 month study period. The only data previously available regarding inguinal hernia repair volumes in South Africa, was Pape et al. from a regional level hospital over a 4 year period showing 379 elective and 87 emergency admissions [5], while Klopper et al. from a tertiary level hospital over a 3 year period showed that inguinal hernia repair was the second most commonly performed procedure in their Acute Care and General Surgery Unit, accounting for 352 (11.2%) of all procedures performed [6].
We found that in our setting hernias were repaired by an open technique in 292 cases (76.8%), and laparoscopically in 88 cases (23.2%). International and South African hernia societies recommend laparoscopic repair be performed for bilateral and recurrent hernias, as well as females with hernias, as they are associated with less pain, numbness, and haematoma formation, and provide a quicker return to full function and work \cite{3,4}. We found that in our study laparoscopic repair was performed for 63.6% of bilateral hernias, 39.3% of recurrent hernias, and 45% of females with hernias. This compares favourably with the quality standards set out by the Royal College of Surgeons (RCS) in England, who recommend that there should be a laparoscopic repair rate of > 40% for females, and patients with bilateral and recurrent hernias \cite{7}. Unilateral hernias in males were repaired laparoscopically in 19.3% of our cases.

The one constant proviso when recommending laparoscopic hernia repair, is that the surgeon is adequately trained, so as to be proficient and attain comparable outcomes to open surgery, which is still held as the gold standard. Our study showed that of the 88 laparoscopic repairs performed, non-consultant surgeons were present at 70 cases (79.5%), but were the primary surgeon at only 15 cases (17%). Published series all show that to be proficient in laparoscopic inguinal hernia repair techniques, surgeons require between 100 - 200 cases to achieve independent competence \cite{8-10}. Our current laparoscopic volumes fall below what would be required to overcome this learning curve for independent practice. This however seems to be a universal problem, with a review by Köckerling et al. showing that surgical trainees averagely perform 50-100 hernia repairs during their training, of which only 25 are laparoscopic \cite{11}. Furthermore, Kurashima et al. showed that training required to achieve competence needs to be structured with a goal-directed curriculum and validated assessment tools \cite{12}, while Simons et al. and Poelman et al. showed it needs to be supervised by a mentor, and started fairly early in the surgical training program \cite{13,14}. Currently, no such laparoscopic training exists in South Africa.

We also noted that the primary surgeon was a non-consultant at 254 cases (66.8%), of which 94.1% were open repairs. Non-consultant surgeons also performed emergency inguinal hernia repairs 90.1% of the time. Consultants only assisted non-consultants for a total of 43 cases (16.9%), of which 14 were laparoscopic. This means that 88.6% of open hernia repairs are
performed without consultant supervision. While one of the factors that make the Lichtenstein tension-free technique so popular is the reported ease with which the procedure can be learned, we also know that around 60 cases are reportedly needed to attain proficiency.\textsuperscript{[3]} As there is no standardised assessment tool or minimum number of supervised procedures required before a South African surgeon is signed off as being competent, and as so many procedures are performed without consultant supervision, including difficult emergency cases, a question exists about practitioners’ competence and proficiency in performing these operations.

Laparoscopic hernia repair, especially for primary unilateral hernias in males, remains a contentious issue and there has been a relatively slow uptake in its general use. Trevisonno \textit{et al.} conducted a study amongst surgeons and trainees in North America and found that 46\% of respondents never performed laparoscopic inguinal hernia repairs, and of those, only 26\% were interested in learning.\textsuperscript{[15]} To overcome this problem, Köckerling \textit{et al.} have suggested that dedicated hernia centres may be established, where specialist hernia surgeons work who have already passed their learning curve.\textsuperscript{[16]} This would provide high volume centres with better patient outcomes and could also function as hernia training centres. Given the resource constraints, this is a model which could be considered in the South African setting.

While the volume of disease that we face appears to be high, there are questions that exist around the structure and assessment of our training, especially with regards to exposure to laparoscopic hernia repairs. There exists great variability between hospitals and the trainee’s experience is influenced by the rotations they get. Proficiency could be improved through laparoscopic simulation training, with many training institutions now having surgical skills labs were this could be undertaken. Structured training could be formulated, with minimum simulated requirements set. This can also potentially be improved by adopting already available assessment tools. Existing consultants also need to be upskilled through proctorship programmes, so that they can then teach trainees at the respective training hospitals.
A potential weakness of the study is that the data was retrospectively collected over a fixed 12-month period, and quality could vary between the different hospitals due to how variables were captured. The study also only provides an overview, and not an individual trainee exposure to laparoscopic repair through the course of their training. Further research is required to assess trainee operative exposure throughout the course of a surgical specialist training programme.

**Conclusion**

Inguinal hernias in our setting are predominantly repaired by open surgery, by non-consultant surgeons. The likelihood of laparoscopic repair varies significantly depending on which hospital the patient is referred to. Non-consultants have limited exposure to performing laparoscopic hernia repairs as the primary surgeon.

**Acknowledgements**

The authors would like to thank the heads of the various surgical units, for contributing their patient data to the study: Dr Heather Bougard (NSH), Dr Ferhana Gool (MPH), and Dr Jeremy Plaskett (VHW).

**Conflicts of interest**

The authors declare no conflicts of interest.
References


Appendices

Appendix A: Author guidelines of South African Journal of Surgery

Authorship

Named authors must consent to publication. Authorship should be based on substantial contribution to:

(i) conception, design, analysis and interpretation of data;

(ii) drafting or critical revision for important intellectual content; and

(iii) approval of the version to be published. These conditions must all be met (uniform requirements for manuscripts submitted to biomedical journals; refer to www.icmje.org).

Conflict of interest

Authors must declare all sources of support for the research and any association with a product or subject that may constitute conflict of interest.

Research ethics committee approval

Provide evidence of Research Ethics Committee approval of the research where relevant.

Protection of patient's rights to privacy

Identifying information should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or
parent or guardian) gives informed written consent for publication. The patient should be shown the manuscript to be published.

**Ethnic classification**

References to ethnic classification must indicate the rationale for this.

**Manuscripts**

Shorter items are more likely to be accepted for publication, owing to space constraints and reader preferences.

Original articles not exceeding 3,000 words, with up to 6 tables and illustrations, are usually observations or research of relevance to surgery. References should preferably be limited to no more than 15. Please provide a structured abstract not exceeding 250 words, with the following recommended headings: *Background, Objectives, Methods, Results, and Conclusion*.

**Manuscript preparation**

Refer to articles in recent issues for the presentation of headings and subheadings. If in doubt, refer to 'uniform requirements' - www.icmje.org. Manuscripts must be provided in UK English.

Qualification, affiliation and contact details of ALL authors must be provided in the manuscript and in the online submission process.

Abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.

Scientific measurements must be expressed in SI units except: blood pressure (mmHg) and haemoglobin (g/dl). Litres is denoted with a lowercase 'l' e.g. 'ml' for millilitres). Units should be preceded by a space (except for %), e.g. '40 kg' and '20 cm' but '50%'.

39
Greater/smaller than signs (> and 40 years of age'. The same applies to ± and °, i.e. '35±6' and '19°C'.

Numbers should be written as grouped per thousand-units, i.e. 4 000, 22 160...

Quotes should be placed in single quotation marks: i.e. The respondent stated: '...'

Round brackets (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.

**General formatting**

The manuscript must be in Microsoft Word or RTF document format. Text must be single-spaced, in 12-point Times New Roman font, and contain no unnecessary formatting (such as text in boxes, with the exception of Tables).

**Illustrations and tables**

If tables or illustrations submitted have been published elsewhere, the author(s) should provide consent to republication obtained from the copyright holder.

Tables may be embedded in the manuscript file or provided as 'supplementary files'. They must be numbered in Arabic numerals (1,2,3...) and referred to consecutively in the text (e.g. 'Table 1'). Tables should be constructed carefully and simply for intelligible data representation. Unnecessarily complicated tables are strongly discouraged. Tables must be cell-based (i.e. not constructed with text boxes or tabs), and accompanied by a concise title and column headings. Footnotes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || then ** †† ‡‡ etc.

Figures must be numbered in Arabic numerals and referred to in the text e.g. '(Fig. 1)'. Figure legends: Fig. 1. 'Title...' All illustrations/figures/graphs must be of high resolution/quality: 300 dpi or more is preferable but images must not be resized to increase...
resolution. Unformatted and uncompressed images must be attached as 'supplementary files' upon submission (not embedded in the accompanying manuscript). TIFF and PNG formats are preferable; JPEG and PDF formats are accepted, but authors must be wary of image compression. Illustrations and graphs prepared in Microsoft Powerpoint or Excel must be accompanied by the original workbook.

References

Authors must verify references from the original sources. Only complete, correctly formatted reference lists will be accepted. Reference lists must be generated manually and not with the use of reference manager software. Citations should be inserted in the text as superscript numbers between square brackets, e.g. These regulations are endorsed by the World Health Organization,[2] and others.[3,4-6] All references should be listed at the end of the article in numerical order of appearance in the Vancouver style (not alphabetical order). Approved abbreviations of journal titles must be used; see the List of Journals in Index Medicus. Names and initials of all authors should be given; if there are more than six authors, the first three names should be given followed by et al. First and last page, volume and issue numbers should be given. Wherever possible, references must be accompanied by a digital object identifier (DOI) link and PubMed ID (PMID)/PubMed Central ID (PMCID). Authors are encouraged to use the DOI lookup service offered by CrossRef.


Other references (e.g. reports): should follow the same format: Author(s). Title. Publisher place: publisher name, year; pages. Cited manuscripts that have been accepted but not yet published can be included as references followed by '(in press)'. Unpublished observations and personal communications in the text must not appear in the reference list. The full name of the source person must be provided for personal communications e.g. '...(Prof. Michael Jones, personal communication)'.

Proofs

A PDF proof of an article may be sent to the corresponding author before publication to resolve remaining queries. At that stage, only typographical changes are permitted; the corresponding author is required, having conferred with his/her co-authors, to reply within 2 working days in order for the article to be published in the issue for which it has been scheduled.
Appendix B: Study Protocol

(as submitted to Surgical Department Research Committee)

Protocol Title:
What is the current practice of inguinal hernia repair at University of Cape Town affiliated hospitals?

Principal Investigator:

<table>
<thead>
<tr>
<th>Name</th>
<th>Surname</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>JC</td>
<td>Kloppers</td>
<td><a href="mailto:jckloppers@gmail.com">jckloppers@gmail.com</a></td>
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</table>

Co-Investigators:

<table>
<thead>
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<th>Name</th>
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<tr>
<td>Earl</td>
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<td><a href="mailto:earlscout@gmail.com">earlscout@gmail.com</a></td>
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</table>

Introduction (300-800 Words):

A hernia is the protrusion of an organ or the fascia of an organ through the wall of the cavity that normally contains it. Inguinal hernias, this protrusion occurs through the inguinal canal in the groin. Hernias are very common, with a lifetime occurrence quoted in the literature of 27-43% in males and 3-6% in females. As surgery is the only cure, inguinal hernia surgery is also one of the most commonly performed general surgical operations, with more than 20 million procedures performed annually [1]. Historical data have shown that the hernia prevalence and surgery rates, as well as techniques employed in the developing world [2,3], are quite different to the picture seen in the first world.
Groin hernia surgery, which involved reducing and resecting the hernia sac along with reinforcement of the posterior wall with sutures, was first performed towards the end of the sixteenth century. Since that time, the technique of repair has undergone many variations and modifications. Prosthetic material was introduced in the 1960’s, and by the 1980’s minimally invasive techniques were also being employed, adding another management modality to the surgeons armamentarium [4]. The fact that so many different repair options exist, suggest that there isn’t a “single best method”, and that the modern general surgeon needs to be well versed in a number of different techniques, to best individualise patient treatment.

Despite these various options, a few recommendations have however come to the fore. It is now generally accepted that all hernias should be repaired with mesh, and that the ideal position for mesh is in the pre-peritoneal space, as this offers the most physiological support. The current international guidelines also recommend that a laparoscopic inguinal hernia repair be the procedure of choice for primary unilateral and bilateral hernias, as they are associated with less pain, numbness, and haematoma formation, and provide a quicker return to full function and work. Laparoscopic repairs are also recommended for recurrences, where the primary repair was an open one. These recommendations are however made with the proviso that the surgeon has specific expertise, and that sufficient resources are available [5].

A learning curve is associated with proficiency in any new technique, but the current evidence suggests that to be proficient in laparoscopic inguinal hernia repair techniques, this learning curve is significant, with trainees requiring between 100-200 cases to achieve independent competence [6-8]. The training required to achieve competence also needs to be structured, supervised by a mentor, and started fairly early in the surgical training program [9,10].

Very limited data exists as to what the burden of inguinal hernia surgery is in South Africa, with even less known about our laparoscopic experience [11]. South Africa faces a very unique problem in that our society comprises a mix of both first and third worlds, with the surgeon required to straddle this divide in his practice. In weighing up the best management
strategy for each patient, one has to weigh up cost (i.e. open surgery consumables are cheaper), vs socio-economic factors like improved functionality and quicker return to work and being economically active (i.e. laparoscopic surgery better) [9]. The guidelines of the Hernia Interest Group of South Africa therefore recommend 3 operations that general surgeons should be equally proficient in, i.e. laparoscopic inguinal hernia repair as the first choice, the Lichtenstein technique as the preferred method for open repairs, and the Shouldice technique for tissue repairs, when gangrenous bowel is present or a bowel resection is performed [12].

The objective of this study is to quantify the current practice with inguinal hernia surgery in UCT affiliated hospitals, and to assess trainee exposure to laparoscopic repair techniques.

**Research Question/ Primary Aim:**

What percentage of inguinal hernia repairs are performed at University of Cape Town affiliated hospitals laparoscopically, and what percentage of these laparoscopic repairs are performed by non-consultant grade doctors?

**Secondary Aims:**

What percentage of all inguinal hernia repairs are emergent versus elective?

**Study Design:**

This will be a retrospective, observational study conducted at University of Cape Town affiliated hospitals.

**Source of Data**

*I.e. Patient Folder review or Registry database (if a registry please provide HREC number)*

The data will be retrieved from already existing surgical unit databases. 1: Acute care surgery unit at Groote Schuur hospital, 2: New Somerset hospital surgical department, 3: Mitchells
Plain hospital surgical department, and 4: the theatre logs at Victoria Hospital West. The heads of the surgical units at all the hospitals have been contacted, and have agreed with their data being used in the study.

**Dates of data collection:**

*Please be specific, i.e. 1 Jan 2016 to 31 Dec 2016*

Data will be collected from the 1st January 2017 to 31st December 2017.

**Justification for chosen timeline:**

*Please provide a reason for dates of data collection*

*I.e. Start date was when database was implemented, numbers needed to fulfil sample size calculation or previously reported studies have used this timeframe.*

Historical data have shown that around 450 inguinal hernia procedures get performed annually across the affiliated hospitals. This number will be sufficient to fulfil our sample size.

**Inclusion Criteria:**

All inguinal hernias performed on patients older than 18 years of age during the data collection period

**Exclusion Criteria:**

*These should not be the opposite of the inclusion criteria, but exclusions from the inclusion criteria*

Patients younger than 18 years of age
Statistical Analysis:

This should also be completed for a descriptive audit.

I.e. Data will be described in means and standard deviations for normally distributed data and medians and confidence intervals for non-parametric data.

The outcome is laparoscopic versus open hernia repair. Chi-squared test will be used to compare consultants to non-consultants. In addition, descriptive statistics and graphical methods will be used to characterize the data. The 5% level of significance will be considered. In the case of a statistically significant result, the probability value (p-value) will be given.

Sample Size analysis / Power calculation:

This is required when Primary aim compares two or more groups.

To attain a confidence level of 95% and a confidence interval of 5%, given a population of around 450, a sample size of 208 has been calculated.

Privacy and confidentiality:

Data capture will take place in an Excel spreadsheet, and will be performed by the co-investigators. The computer file will only be available to the principal- and co-investigators, and is password protected. No personally identifiable data will be collected in the data tool.

Project Timeline:

March 2018: submission to DRC

April 2018: submission to HREC

May – July 2018: data collection

August – Dec 2018: write up
Budget:

*If Applicable*

There will be no costs involved with the conduct of this study

Dissemination of data:

*i.e. Conference presentation, Publication, Degree*

We intend to submit this research for publication, as we hope this will inform and improve surgical training. This research will also form part of my MMed degree

References:


   (accessed: 12/03/2018)

Appendix C: Departmental Research Committee approval

Dr E Scout
Department of Surgery
University of Cape Town

Dear Dr Scout,

RE: Project 2018/038

PROJECT TITLE: What Is The Current Practice Of Inguinal Hernia Repair At University Of Cape Town Affiliated Hospitals

The above protocol has been reviewed by the Department of Surgery Research Committee. I am pleased to inform you that the committee approved the scientific merit of the study, and endorse the protocol for submission to the relevant ethics committee.

Although this letter serves as confirmation that the above protocol has successfully passed through the surgical DRC, respective ethics committees still require DRC chair signature before submission.

Please use the above project number in all future correspondence,

Yours sincerely,

Signature Removed

DR TIMOTHY PENNEL
CHAIRMAN: RESEARCH COMMITTEE

"OUR MISSION is to be an outstanding teaching and research university, educating for life and addressing the challenges facing our society."
Appendix D: Faculty Ethics Committee approval

20 June 2018

HREC REF: 390/2018

Dr JC Kloppers
General Surgery
J-floor, OMB

Dear Dr JC Kloppers

PROJECT TITLE: WHAT IS THE CURRENT PRACTICE OF INGUINAL HERNIA REPAIR AT UNIVERSITY OF CAPE TOWN AFFILIATED HOSPITALS (MMed Candidate - Dr Earl Scout)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has formally approved the above-mentioned study subject to confirming the following:

- Please confirm that these databases have HREC approval. If not, they should be registered with the HREC.

Approval is granted for one year until the 30 June 2019.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Form can be found on our website: [www.health.uct.ac.za/fhs/research/humanethics/forms](http://www.health.uct.ac.za/fhs/research/humanethics/forms))

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator must obtain appropriate institutional approval, where necessary, before the research may occur.

The HREC acknowledge that the student, Dr Earl Scout will also be involved in this study.

Yours sincerely

Signature Removed

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE