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AUDIT OF EVOLVING ROLES OF LAPAROSCOPY IN THE CURRENT SURGICAL PRACTICE AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL: A 5 YEAR REVIEW

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UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the Degree of Master of Medicine in Surgery

Johannesburg January 2021

DECLARATION

I, Weludo Ngwisanyi, declare that this research report is my own work. It is submitted in partial fulfilment of the Degree of Master of Medicine in Surgery at the University of the Witwatersrand. It has not been submitted before for any degree or examination at this or at any other university. The report is written in the submissible format to be send for consideration for publication in the South African Journal of Surgery.

Weludo Ngwisanyi



_____

I certify that this study was approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg, South Africa. The ethics number is M190570.

Weludo Ngwisanyi



_____

Dedication

I wish to dedicate this work to the two strongest women I know, viz. my mother, Kumbulani Ngwisanyi, and my only sister, Tawana Ngwisanyi. Although you have been dealt the most unfair cards life has to offer, you have endured the hardship with strength and fortitude. I love you both.

ACKNOWLEDGEMENTS

I wish to express my most sincere gratitude to my supervisors, Dr Ifongo Bombil and Dr Marietha Nel, for their comprehensive and prompt assistance and the support they provided throughout this project. Special thanks to my friend Dr Thuso David who acted as my mentor from the start to conclusion of this project. I also wish to thank the university postgraduate studies staff and the Human Research Ethics Committee staff for their assistance during the study.

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LIST OF ABBREVIATIONS

BC	Before Christ
CBD	Common Bile Duct
CHBAH	Chris Hani Baragwanath Academic Hospital
HICs	High-income countries
LA	Laparoscopic Appendicectomy
LMICs	Low-middle-income countries
LS	Laparoscopic Surgery
N	Number
NCCN	National Comprehensive Cancer Network
OA	Open Appendicectomy
POEM	Peroral Endoscopic Myotomy
SD	Standard Deviation
VATS	Video-assisted Thoracic Surgery

AUDIT OF EVOLVING ROLES OF LAPAROSCOPY IN THE CURRENT SURGICAL PRACTICE AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL: A 5 YEAR REVIEW

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Abstract

Objective: The objective of this study was to determine the evolution of LS in selected procedures.

Design: This was a retrospective cross-sectional study to investigate and analyse the frequency of nine selected procedures (MAS *versus* open) performed from January 2014 to December 2019.

Setting: The study was conducted at the Chris Hani Baragwanath Academic Hospital.

Outcome measures: Data were collected from theatre registries. Statistical analysis was performed using the software IMB SPSS. The data were analysed using descriptive statistics of mean and standard deviation for age, and percentage and frequencies for categories of variables.

Results: Of the 3745 patients involved in the study, 59.1% were males and 40.9% were females. The mean age of the patients was 35.17±17.30 years. Laparoscopic surgery was represented in 43.2% of the procedures, with laparoscopic appendicectomy (46.73%) and laparoscopic cholecystectomy (32.69%) being the most commonly performed procedures**..** Twenty-five adrenalectomies were performed over the study period, and of those 12 (52%) were performed laparoscopically. All the thymectomies (12) were performed thoracoscopically, with one conversion.

Conclusion: The findings of this study suggest that there has been an increase in the overall incidence of laparoscopic surgery in selected procedures at CHBAH.

WORD COUNT: 193

Introduction

Surgery differs from other medical disciplines in that to effect healing, it requires invasion of the body by means of a sharp instrument/instruments. [1] For many years open surgery has been the mainstay of surgical intervention. Over centuries, surgical techniques have improved, resulting in better patient outcomes. [1]

Since its inception in the late 1980s, laparoscopy has revolutionised the practice of surgery. [2, 3] The introduction of laparoscopic cholecystectomy in 1987 led to the rapid development of laparoscopic surgery (LS) that is gaining momentum as the standard of care for a wide range of surgical pathologies. [4] The role of minimal access surgery (MAS) in acute care surgery involving abdominal and thoracic pathologies has also increased significantly over the past 30 years, [5] both as a diagnostic and as a treatment tool. [4] The benefit of MAS over open surgery in selected cases should not be understated; it reduces total hospitalisation costs; shortens postoperative recovery times; in many cases it reduces surgical trauma and post-operative pain, and enables an earlier return to work. [4, 6]

Worldwide, the trend of MAS varies from one region to another. In developed nations with abundant resources, the rates of MAS are significantly higher than in low-middle-income nations. The rate of MAS in developed countries has risen exponentially, to the extent that it has significantly replaced open surgery, especially in elective settings. Despite being technically challenging and requiring the use of costly equipment, overall MAS has been shown to reduce hospital costs in countries that have adopted it, especially with improved skills as noted in centres of excellence. [6]

Information on the development of MAS in low-middle-income countries (LMIC) is limited. The available literature suggests that the rates of performing MAS in these countries are lower than in developed countries, [7] although Alfa-Wali et al report that for various reasons, there has been a sporadic and marginal adoption of MAS in LMICs. [7] Barriers to MAS in LMICs is not only attributed to a lack of funding and expertise, but also to inadequate distribution of funds; the hierarchical nature of surgical practices that may block acquisition of new technology and the attitude of surgeons who might be unwilling to innovate. [8] However, similar variety of procedures performed in HIC is also achieved in LMICs. [7] In South Africa, studies by Koto et al, demonstrated the safety and practicality of MAS on hemodynamically stable patients as well as in the management of stable penetrating thoraco-abdominal injuries. [8, 10, 11] Furthermore, in 2015 Bombil et al. reported encouraging results for the use of laparoscopy in selected trauma cases. [12]

Worldwide, laparoscopic cholecystectomy (LC) has gained popularity to become the standard of care in the surgical management of cholecystitis. Reports from Australia, Canada and the United States of America revealed increased rates of laparoscopic cholecystectomy. [6, 13, 14] Even in remote North American settings with limited resources, the success rate of laparoscopic cholecystectomy was noticeable when compared with the results from international centres of excellence. [14] A meta-analysis of randomized controlled trials have also described the evolution of MAS and its preference over open surgery. [15] Laparoscopic cholecystectomy has rapidly spread across the globe like a pandemic. Even in Africa where, depending on logistics and expertise, it has also became the standard of care. In South African teaching hospitals, laparoscopy is by default the procedure of choice with a success rate of approximately 90%. [16]

Appendicitis ranks among the most common surgical emergencies and affects people of all ages. [17] Laparoscopic appendectomy (LA) has now positioned itself as the gold standard of care in the management of appendicitis. [17] The incidence of laparoscopic appendicectomy is gradually on the rise worldwide, despite regional variations. Although the local literature is limited, there are studies that report the safety and advantages of laparoscopy even in cases of complicated appendicitis. [18, 19, 20]

Inguinal hernia represents three-quarters of all abdominal wall hernias, and open hernia repair is performed as a day case in many centres in high-income countries, under local anaesthesia at low cost, with satisfactory results. [21] The laparoscopic approach is however, also gaining momentum although at slightly higher cost and with a prolonged operating time. It is also a more difficult technique to master. [22]

Laparoscopic anti-reflux procedures have evolved over the past two decades with the acquisition of improved laparoscopic skills. [23] Since gastroesophageal reflux disease (GERD) hampers the lifestyle of many sufferers, there will always be cases demanding medical or surgical attention, and the laparoscopic approach is considered the standard of care. [24]

There are several other surgical procedures which, although uncommon, have shifted to the minimally invasive approach. Adrenalectomy, thymectomy and splenectomy [4, 3, 6] are some illustrations. Depending on logistics and skills, regional incidence varies. Data on the profile of these procedures in Africa, particularly in sub-Saharan Africa are rare. The scarcity of data on the evolution of MAS at Chris Hani Baragwanath Academic Hospital (CHBAH) and

other South African teaching hospitals prompted this study. CHBAH is the largest hospital in South Africa with nearly 3000 inpatient beds.

Methods and materials

Study design

This was a retrospective cross-sectional study to investigate and analyse the frequency of 9 selected procedures (MAS *versus* open) performed at CHBAH from January 2014 to December 2019.

Inclusion and exclusion criteria

Data were collated on all patients who had undergone any of the selected procedures during the study period in the department of general surgery. Patients who underwent procedures other than those selected for the study, as well as all patients under the age of ten years were excluded. In this particular hospital setting, all patients under the age of 10 years are managed by paediatric surgery. The year 2015 were also excluded from the study due to a lot of missing data.

Statistical analysis

Statistical analysis was performed by means of IBM SPSS 25 software. Use of the Chi-square test revealed that significant changes had occurred over time. The data were summarized using descriptive statistics of mean and standard deviation for continuous variables and proportion by ratio or percentage for categorical variables. Binary logistic regression was used to determine the univariate association between the type of procedure and the year. The results are presented in figures and tables.

Ethics approval was obtained from the Human Ethics Committee of the University of the Witwatersrand (clearance number: **M190570)** and from the Research Review Board of CHBAH.

Results

The records of 3745 patients were collected during the study period. The mean age of the patients was 35 years, with the majority of patients aged 30 years and younger (see Table 1). In the majority of cases (56.8%), open procedures were performed while 43.2% of the patients underwent MAS. The procedures were further categorized according to the year in which they were performed. All results are depicted in tables (1, 2, and 3) and figures (1, 2, 3 and 4)

Table 1: Socio-demographic characteristics of the patients involved in the study

Total number of patients	**n = 3745 (100%)**
Mean age (years), SD	35 (17.3)
Age in category, years (%)	
≤ 20	887(23.7)
21 – 30	848(22.6)
31 – 40	761(20.3)
41 – 50	480(12.8)
51 – 60	392(10.5)
61 – 70	269(7.2)
>70	108(2.9)
Men, n (%)	2332(59.6)
Women, n (%)	1513(40.4)
Men/Women ratio	3:2

Table 2: Summary of the number and percentages of procedures performed the conversion rates from 2014 to 2019

Procedures	Laparoscopic (N = 1617)		Open (N = 2128)		Total	Conversion
	N	%	N	%	N (%)	n/N (%)
Appendicectomy	849	52.5	1149	54.0	1998(53.4)	87/849 (10.3)
Cholecystectomy	594	36.7	33	1.6	627(16.7)	19/594 (3.2)
CBD exploration	45	2.8	11	0.5	56(1.5)	8/45 (17.8)
Inguinal hernia repair	40	2.5	453	21.3	493(13.2)	2/40 (5.0)
Perforated peptic ulcer repair	22	1.4	204	9.6	226 (6.0)	0(0.0)
Laparoscopic anti-reflux procedure	21	1.3	0	0.0	21(0.6)	3/21(14.3)
VATS* (chest trauma)	17	1.1	210	9.9	227 (6.1)	1/17 (5.9)
Adrenalectomy	13	0.8	12	0.6	25(0.7)	6/13 (46.2)
Thoracoscopic thymectomy	12	0.8	0	0.0	12 (0.3)	1/12 (8.3)
Whipple's procedure	6	0.4	54	2.5	60 (1.6)	1/6 (16.7)

Table 3: Percentages of common and uncommon* procedures per year

Laparoscopic procedure n (%)	2014 (n=184)	2016 (n=268)	2017 (n=452)	2018 (n=400)	2019 (n=313)
Laparoscopic cholecystectomy	91 (49.5)	80 (29.9)	156 (34.5)	142 (35.5)	125 (39.9)
Laparoscopic adrenalectomy*	2 (1.1)	0 (0)	1 (0.2)	3 (0.8)	7 (2.2)
Laparoscopic appendicectomy	76 (41.3)	169 (63.1)	246 (54.4)	221 (55.3)	137 (43.8)
Laparoscopic CBD exploration*	1 (0.5)	2 (0.7)	16 (3.5)	7 (1.8)	19 (6.1)
Laparoscopic inguinal hernia repair	5 (2.7)	7 (2.6)	14 (3.1)	8 (2)	6 (1.9)
Laparoscopic perforated peptic ulcer repair	4 (2.2)	3 (1.1)	5 (1.1)	3 (0.8)	7 (2.2)
Thoracoscopic thymectomy*	0 (0)	3 (1.1)	4 (0.9)	2 (0.5)	3 (0.4)
Laparoscopic Whipple's procedure*	0 (0)	0 (0)	2 (0.4)	3 (0.8)	1 (0.3)
Laparoscopic anti-reflux procedure*	1 (0.5)	2 (0.7)	5 (1.1)	8 (2)	5 (1.6)
Video-assisted thorascopy*	4 (2.2)	2 (0.7)	3 (0.7)	3 (0.8)	5 (1.6)

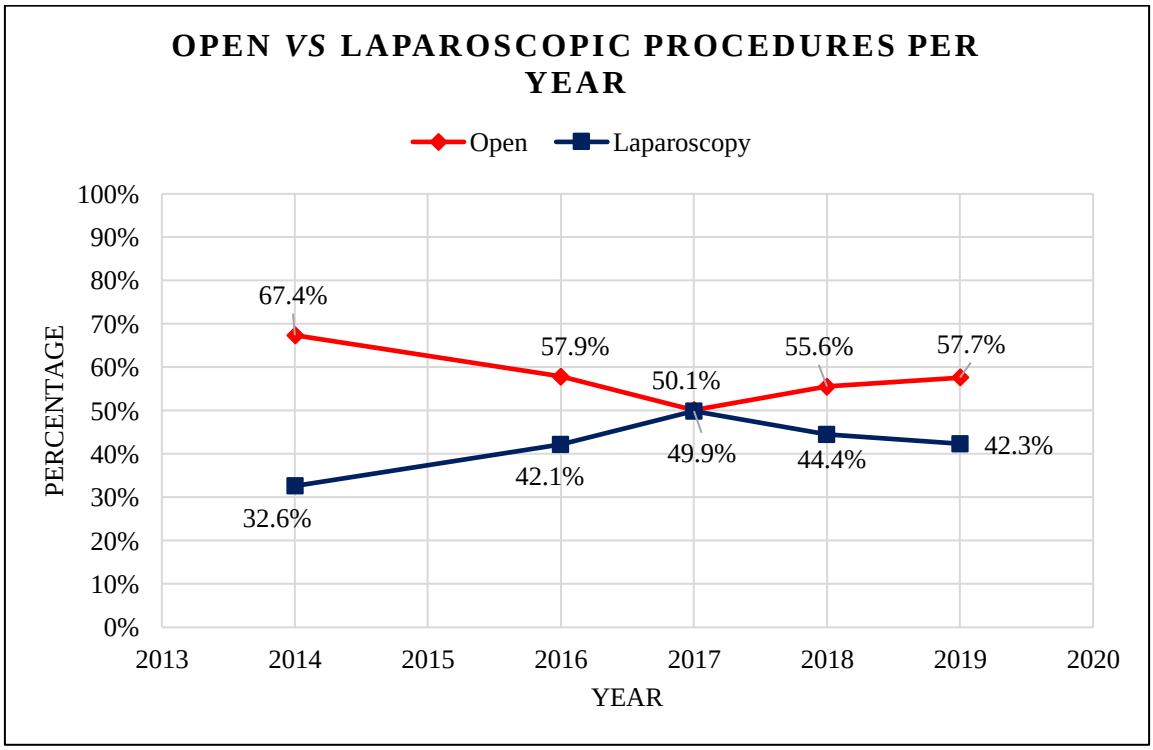


Figure 1: Open *versus* laparoscopic procedures per year (n=3745)

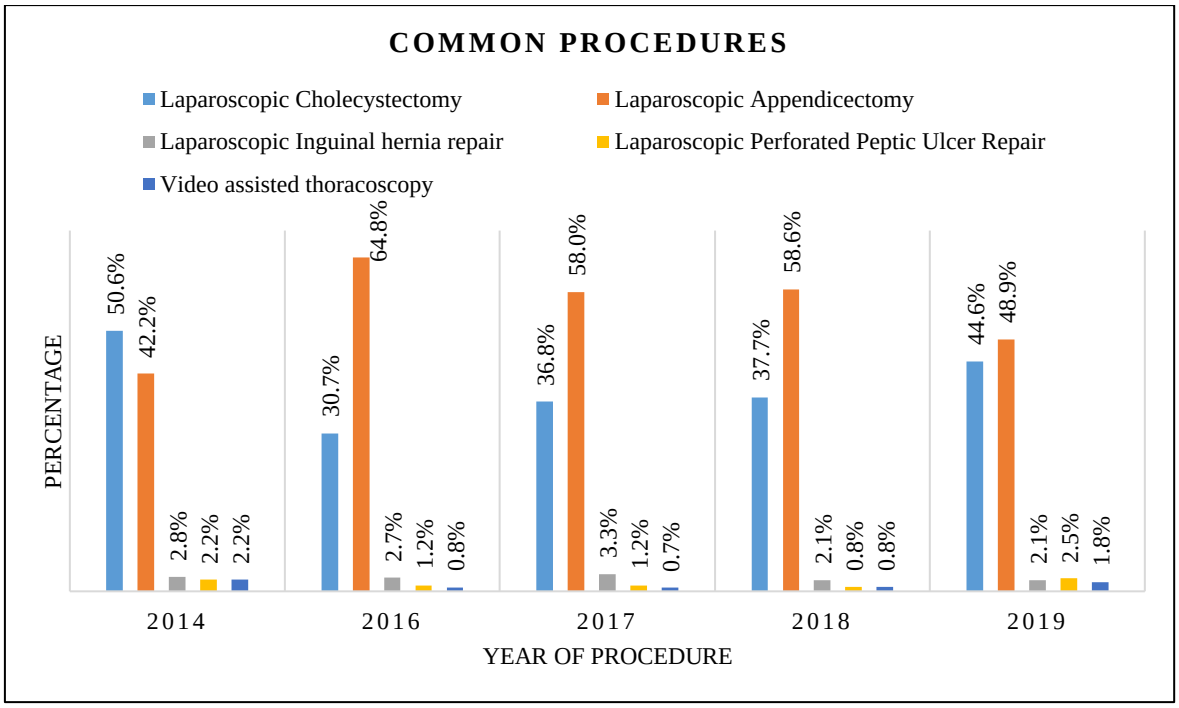


Figure 2: Percentages of common laparoscopic procedures per year

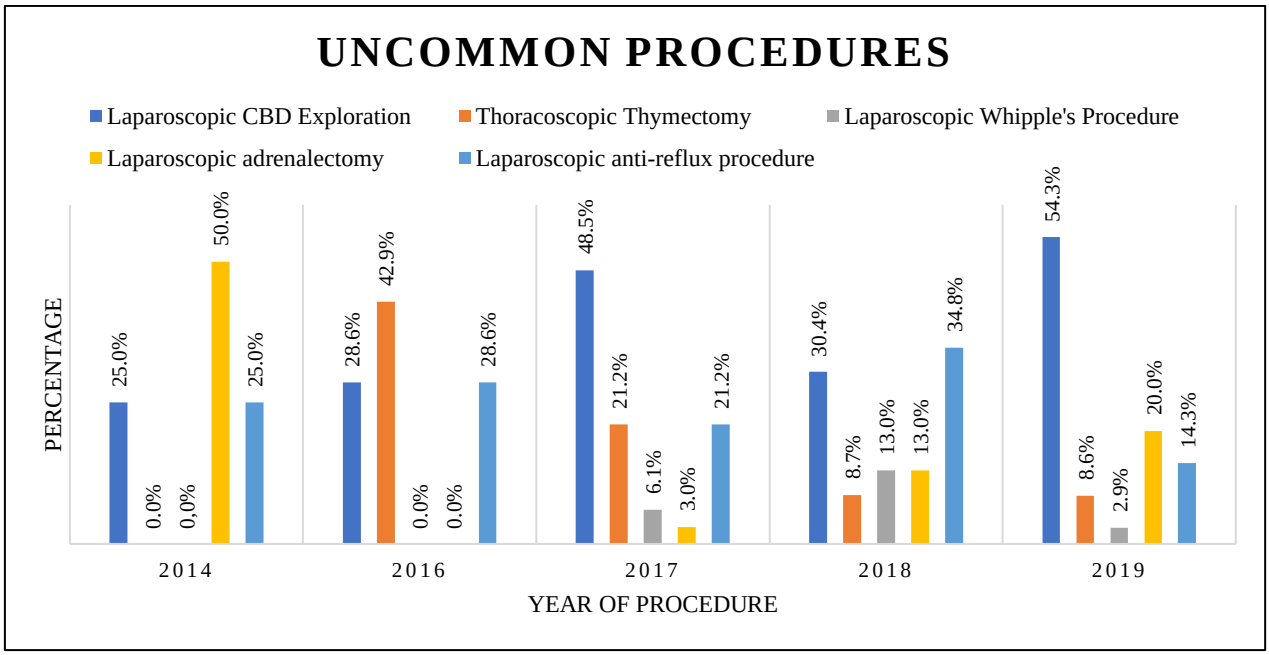


Figure 3: Percentages of uncommon laparoscopic procedures per year

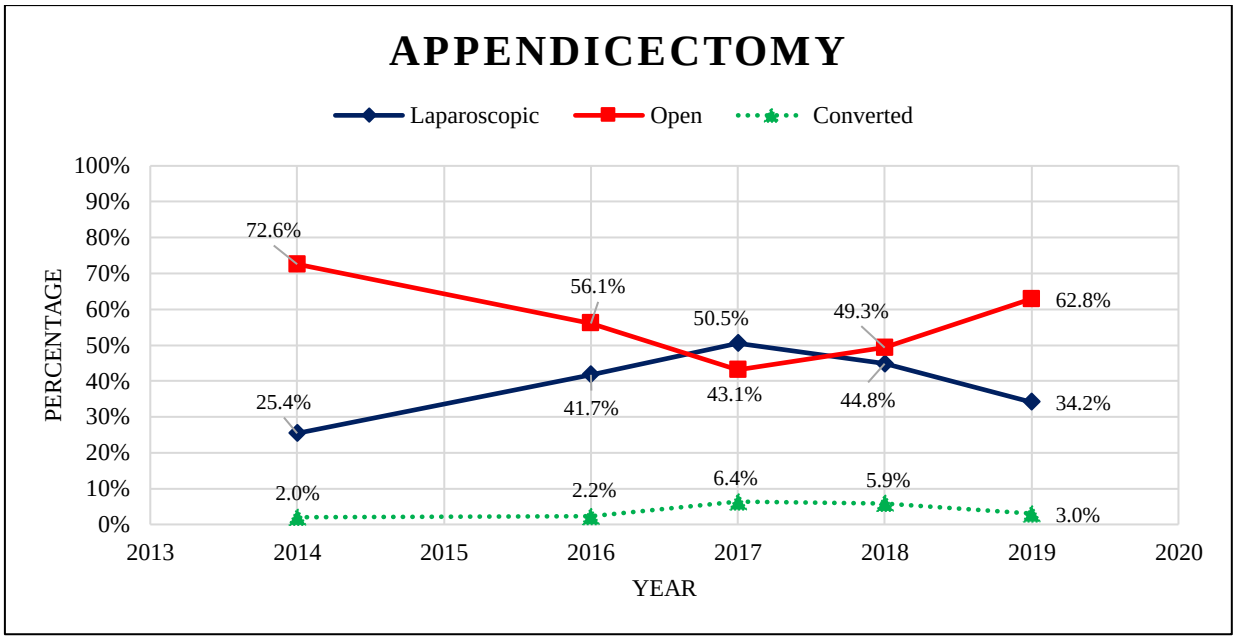


Figure 4: Percentages of open *versus* laparoscopic appendicectomies

Discussion

The records of 3745 patients were collected during the study period. The mean age of the patients was 35 years, with the majority of patients aged 30 years and younger (Table 1). In the majority of cases (56.8%), open procedures were performed while 43.2% of the patients underwent MAS. The procedures were further categorized according to the year in which they were performed.

To our knowledge, this is the first study to investigate trends of MAS in South Africa. The highest rate of open procedures occurred in 2014 (67.3%) and the highest rate of laparoscopic procedures was in 2017 (49.8%) (Figure 1).

From 2014, there was a gradual increase in the total number of surgical procedures performed, reaching a peak in 2017. This was followed by a small decrease in 2018, and then a sharp decline in 2019. It has not been possible to explain the aforementioned changes in the total number of patients who underwent surgical procedures. The explanation to this finding is outside the scope of this research.

The predominance of men (59.6%) over women (40.1%) may be due to the fact that the majority of common pathologies (appendicitis, inguinal hernia and chest trauma) affect males. [21, 25] The findings of this study are similar to those reported by Nguyen et al. in their review of the use of laparoscopy in general surgical operations at academic centers across the United States of America. [2] In our study, more women than men underwent surgical procedures such as anti-reflux surgery and cholecystectomy. This finding is also reported by Nguyen et al. [2] In comparison with 2014, the probability of performing laparoscopic

procedures increased significantly from 39% in 2016 to 52% in 2019. Then from 2018 to 2019 it slightly decreased by 6%, but this was not regarded as statistically significant.

Appendicectomy was the most frequently performed procedure during the study period, accounting for almost half of all surgical procedures (Table 2, Figure 2). This finding is also mentioned by Dai and Shuai in their meta-analysis of randomized controlled trials comparing laparoscopic and open appendicectomy in adults and children. [15] However, despite being the most commonly performed procedure, laparoscopic appendicectomy did not constitute the highest percentage of laparoscopic procedures at CHBAH. The reasons for this might be that laparoscopic appendicectomy is an emerging surgical option for the management of acute appendicitis, and many doctors, especially junior surgical trainees may not be sufficiently competent to perform it unsupervised. Furthermore, acute appendicitis can present with complications that require an emergency appendicectomy at any time, including late at night, when there is least supervision. Additionally, in their mandate to train medical officers and interns, surgical registrars may opt to perform open surgical procedures.

Laparoscopic cholecystectomies accounted for 94.7% of the total number of cholecystectomies performed, which represents the highest percentage of laparoscopic procedures. This may be due to the fact that laparoscopic cholecystectomy is usually performed as an elective procedure mainly by specialists during working hours. These findings are consistent with global trends and mirror reports by other authors. [4, 2, 14] Laparoscopic cholecystectomy was introduced more than three decades ago, and over time the skill required to perform this procedure has improved universally. [4, 2, 14]

Thymectomy and adrenalectomy were the least performed surgical procedures (Table 2, Figure 3). Thymectomy is a relatively uncommon procedure, and according to the National Comprehensive Cancer Network (NCCN), the incidence of thymectomy in the United States of America is 0.15 cases per 100,000 persons. [26] Adrenalectomy is limited to functional and large tumours. According to Mansmann et al., adrenal tumours are not uncommon, affecting 3% to 10% of the human population, but the majority consists of small benign non-functional adrenocortical neoplasm which do not require surgical intervention. [27] This report may explain the small numbers (0.35%) of adrenalectomies performed at CHBAH. Moreover, we speculate that the suboptimal screening for adrenal tumour may be an additional factor contributing to the rarity of this procedure.

Conversion from laparoscopic procedure to open procedure

As the most commonly performed procedure reported over the entire study period, laparoscopic appendicectomy had an average conversion rate of 10.3% (Table 3, Figure 4). This conversion rate is higher compared to the 8.6% and 2.4% conversion rates reported by Switzer et al.[28] and Nguyen et al.[2] respectively. It is possible that the same reasons mentioned in the introduction might also explain the high conversion rate in laparoscopic appendicectomy. Our study shows a conversion rate of 3.20% for laparoscopic cholecystectomy. Numerous sources report different outcomes in the conversion rates of laparoscopic cholecystectomy. Nguyen et al. analysed the use of laparoscopy in general surgical procedures performed at several academic medical centers in the United States of America over a five-year period and found a conversion rate of 14.6% for laparoscopic cholecystectomy. [2] In northern Canada, Verdolin et al. reviewed laparoscopic cholecystectomy in 290 patients over 7 years and reported a conversion rate of 1.37 %. [14] The specific reasons for the conversion of various procedures were not analyzed, although

we suspect the trainee level of expertise and the timing of the procedure to be responsible for conversion. For example, a junior surgical registrar working at night is likely to convert. It is also speculated that difficult cholecystectomies may be performed by junior consultants who may more readily opt to covert compared to experienced surgeons.

Among the uncommon procedures, laparoscopic adrenalectomy had the highest conversion rate, with almost half the number of procedures (46.15%) being converted. It is possible that the larger size, extra-adrenal location (paraganglioma) with its unpredictable vascularity and malignant invasion of major vessels might be reasons. Conzo et al. reported a single case (0.79%) of adrenalectomy conversion out of 126 patients over a 12-year period. The reason for the conversion was suspected infiltration of the renal vessels. [29]

Limitations of the study

The retrospective nature of the study with expected missing data is recognized as limiting factor. The year 2015 was completely removed because of significant amount of data was unavailable as the theatre register could not be found. Another shortcoming is that the expertise of the surgeon performing the procedure and other circumstances associated with it were not evaluated. Such information would have helped to determine the basis of decision-making.

Conclusions

Overall, there was an increase in the incidence of MAS for the selected procedures at CHBAH from 2014 to 2019. In the common procedures group, cholecystectomy achieved the highest laparoscopy rate, whereas laparoscopic appendicectomies seemed to plateau around 40% of all appendicectomies. In the uncommon procedure group, the rate of

thoracoscopic thymectomy fares very well, whereas laparoscopic adrenalectomy shows an upward trend after an initial lag period. Furthermore, other uncommon procedures (VATS, laparoscopic Whipples) are still in their infancy.

Recommendation

We suggest that similar studies be conducted in various teaching hospitals across South Africa to establish national trends in the performance of minimal access surgery.

WORD COUNT: 2184

TOTAL WORD COUNT: 2377

Authorship:

All three authors: W Ngwisanyi, I Bombil and M Nel have consented to this manuscript for publication.

WE: Design, analysis and interpretation of data, drafting the article, final approval.

IF: Conception, interpretation of data, critical revising, final approval of manuscript.

MN: Data interpretation, revision of manuscript critically for intellectual content, final write-up and final approval for submission.

Conflict of interest:

The authors all declare no conflict of interest.

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Data collection tool

The Patient Demographics

Patient ID…….. Age……. Gender……..

Procedure type: **Date of procedure:**

Elective general surgery Elective thoracic surgery

Emergency general surgery Emergency trauma surgery

Procedure	Elective	Emergency
CHOLECYSTECTOMY		
APPENDICECTOMY		
ANTI-REFLUX PROCEDURES		
INGUINAL HERNIA		
SPLENECTOMY		
ADRENELECTOMY		
DIAGNOSTIC LAPAROSCOPY		
THYMOMECTOMY		
THORACOSCOPIES		
PERFORATED PEPTIC ULCER DISEASE		

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr Weludo Ngwisanyi

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M190570

NAME: (Principal Investigator)	Dr Weludo Ngwisanyi
DEPARTMENT:	General Surgery Chris Hani Baragwanath Academic Hospital
PROJECT TITLE:	Audit of evolving roles of laparoscopy in the current surgical practice at Chris Hani Baragwanath Hospital: A 5 year review
DATE CONSIDERED:	31/05/2019
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr Ifongo Bombil and Dr Marietha Nel
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	09/09/2019

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the Third Floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in **May** and will therefore be due in the month of **May** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 14th August 2019

TITLE OF PROJECT:

Audit of Evolving Roles of Laparoscopy in the Current Surgical Practice at Chris Hani Baragwanath Academic Hospital: A 5 Year Review.

UNIVERSITY: Witswatersrand

Principal Investigator: Dr W Ngwisanyi

Department: Surgery

Supervisor : Dr I Bombil

Permission Head Department (where research conducted): Yes

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Academic Hospital. The CEO / management of Chris Hani Baragwanath Academic Hospital is accordingly informed and the study is subject to:-

- **Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.**
- The Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- The MAC will be informed of any serious adverse events as soon as they occur
- Permission is granted for the duration of the Ethics Committee Approval.

Recommended
(On behalf of the MAC)
Date: 14/08/2019

Approved/~~Not Approved~~
Hospital Management
Date: 19/08/2019

a0046051:Final_project_for_Turn-it-in.docx

ORIGINALITY REPORT

6%	2%	4%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Management of Abdominal Hernias, 2013. Publication	1%
2	James Villamere, Alana Gebhart, Stephen Vu, Ninh T. Nguyen. "Utilization and outcome of laparoscopic versus robotic general and bariatric surgical procedures at Academic Medical Centers", Surgical Endoscopy, 2014 Publication	1%
3	ccforum.biomedcentral.com Internet Source	1%
4	Deborah Marshall, Edie Clark, David Hailey. "The impact of laparoscopic cholecystectomy in Canada and Australia", Health Policy, 1994 Publication	1%
5	www.researchsquare.com Internet Source	1%
6	Andreas van den Heever, Juan Scribante, Helen Perrie, Warren Lowman. "Microbial contamination and labelling of self-prepared, multi-dose phenylephrine solutions used at a	1%

INITIAL PROTOCOL

STUDY TITLE: AUDIT OF EVOLVING ROLES OF LAPAROSCOPY IN THE CURRENT SURGICAL PRACTICE AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL: A 5 YEAR REVIEW

Degree: Master of Medicine in General Surgery

Principal Investigator: Dr. Weludo Ngwisanyi

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Date of submission: 13th March 2019

BACKGROUND

Surgery is a profession distinguished from other medical disciplines by the need to cure the disease process by means cutting (1). For many years open surgery has been the mainstay of surgical intervention. Available records report that the first open surgical procedure might have been performed in the era Before Christ (BC). McBurney is credited with consolidating the surgical technique of the open appendectomy over a century ago, a technique that has not significantly evolved since its introduction (2, 3). Open cholecystectomy has always been the mainstay for management of cholecystitis until the introduction of laparoscopic cholecystectomy in the late1980s (4, 5). Over centuries, surgical techniques improved, resulting in better patient's outcome (1). This progress can also be attributed to advance in health care such as anesthesia and infection control.

Minimally invasive surgery has also found its way in the management of both surgical and medical patients since the year 1955 when the rigid endoscopy was used to perform polpectomies (6). Until about three decades ago, endoscopy has been a procedure mostly used by gastroenterologist, internists and gynaecologists (7). The first successful snare polypectomy was reported by, in 1973 by Deyhle. He reported the use of submucosal injection of saline to the sessile colonic polyps. Subsequent to that, the field of endoscopy has grown significantly and as results various methods of endoscopic resection have been introduced. (8). Among endoscopic procedures, peroral endoscopic myotomy (POEM) for achalasia, has been improved to an extent to which its results can be compared with that of traditional Heller's cardiomyotomy (6). Endoscopy has now become the main tool in the diagnosis of many gastrointestinal conditions Worldwide.

Laparoscopy has revolutionized the practice of surgery since the late 1980s (5, 9). The introduction of laparoscopic cholecystectomy in 1987, has led to the rapid development of laparoscopic surgery (LS) that is gaining momentum as a standard treatment for wide spectrum of various surgical pathologies(4). The role of LS in the acute care surgery has also significantly increased over the last thirty years (10), both as a diagnostic and treatment tool of abdominal and thoracic pathologies (4). The benefit of LS over open surgery in selected case cannot be understated; it reduces the total hospitalization costs, shortens postoperative recovery times and in many cases it also reduces surgical trauma and post-operative pain as well as earlier return to work (4, 11).

Worldwide, the trend of laparoscopic surgery varies from one region to another. In the developed nations, with abundance of resources, the rates of LS are significantly higher than in the Low-Middle income nations. The rate of LS in developed countries has risen exponentially and in some cases it has significantly replaced open surgery especially in the elective surgery. Despite being technically challenging and costly, overall LS has been shown to have the potential to reduce the cost of the health bill to countries that have adopted it, especially its use in Teaching Hospitals or centers of excellence (11).

Data on the evolution of LS in Low-Middle income countries (LMIC) is limited, and the available research suggests that the rates of LS in these regions is lower than in the developed countries (12). Barriers to laparoscopic surgery in LMICs cannot only be mainly attributed to lack of funding for costly equipment and expertise; additional factors such as inadequate strategy for funding, hierarchical nature of surgical practices that do not promote adoption of new technology and thirdly the attitude of surgeons who are less willing to carry out more technically complicated and time-consuming procedures (13)

contribute to the low rates of LS. The profile of LS procedures performed in LMICs similar to that in developed countries (12).

In South Africa, a retrospective analysis of prospectively collected data in trauma, by Koto et al, 2019, demonstrated that laparoscopic surgery (LS) was safe and feasible in hemodynamically stable patients (14). Moreover, another study by Koto et al, 2015 and 2018, found that LS was successful in the management of stable penetrating thoraco-abdominal injuries (15, 16). Still in South Africa, Bombil et al, 2015, have reported encouraging results of laparoscopy (17). These South African studies have shown that laparoscopy is possible in resource-limited settings.

In Australia in 1989, cholecystectomy was the first procedure in general surgery to be performed laparoscopically (11). Thereafter, the use of laparoscopy for cholecystectomy gained popularity across the region prior to rigorous and formal assessment of its overall benefits. (11). According to Marshall and colleagues, 1994, there was a 24 percent increase in the use laparoscopic cholecystectomy during the two years of its launch in Canada and Australia (11, 18). In Australia, over the years, as the effectiveness of laparoscopic cholecystectomy was established, it has replaced eighty percent of open procedure (11).

The United States and Canada have also experienced an increase in the rates of laparoscopic cholecystectomy that accounts for the majority of LS procedures. Cholelithiasis affects 10%-15% of the adult population in North America, and the majority of cases are managed laparoscopically (19). Even in remote settings with limited resources, in North America, the use of laparoscopic cholecystectomy continues to produce good

clinical results and the outcome has been noted to be at the same level as those assessed to be at international standards (19). Studies performed in Europe have also described the evolution and preference of laparoscopy over open surgery (20). The inception of LS has resulted in the reduction in the health burden associated with open surgery (11).

Worldwide, appendicitis ranks among the most common surgical emergencies that affect the young and old (21). Laparoscopic appendicetomy (LA) has now positioned itself as the gold standard of care in the management of appendicitis (21). It has proven to be vital in special population groups like morbidly obese, paediatrics, women and geriatrics. One of the advantages of LA in the morbidly obese is that there is less wound infections, shorter hospital stay and less costly (2). Laparoscopic appendicectomy rates have also gradually increased around the world although there is regional variation.

Despite the limited literature locally, there was a study done in Chris Hani Baragwanath Academic Hospital which compared OA with LA, and it showed LA to be safe in complicated appendicitis (22). Almost a similar local study was done in Sebokeng Hospital in complicated appendicitis and concluded that laparoscopic appendicectomy was applicable and safe even in the presence of appendicitis with intraabdominal abscess (23). In another study at Sebokeng Hospital, transumblical laparoscopic-assisted appendicectomy was found to be effective in selected cases and also in resource limited centers as it does not require disposables that are costly (24).

Herniorrhaphy has become one of the commonly performed procedures around the world. One meta-analysis, which compared the benefits of laparoscopic hernia repair against those of open hernia repair came to the conclusion that laparoscopic incisional hernia repair is

associated with reduced operative time, hospital stay and reduced incidence of abscess and wound infections (25). Laparoscopic anti-reflux procedures have evolved over the past two decades, with the acquisition of more laparoscopic skills. This fact was also echoed by Davis et al in 2010 (26).

In addition to the abovementioned procedures, there are several other surgical procedures that are now performed laparoscopically. They include inguinal hernia repair, adrenalectomy. Splenectomy, diagnostic LS and many more uncommon procedures (4, 9, 11). Similarly, the rates of these procedures vary from one region to another, with higher rates in the developed countries and lower rates in the LIMCs. Data on the profile of these procedures in Africa, particularly in sub-Saharan Africa remains scarce, however, published regional studies report similar benefit with the developed world.

Despite the above-mentioned advantages, laparoscopic surgery, like every other surgical intervention, is associated with complications. These complications are associated with factors like the learning curve and the patient's comorbidities. In the hands of a surgeon with limited skills, the procedure can be unnecessarily long, often with prolonged anesthetic time as well as the possibility of conversion to open laparotomy.

Study Rationale

There is scarcity of data on the evolution of laparoscopic surgery (LS) from South African Hospitals. More research in this subject is required in order to help understand the use of LS in our setting. This provides the rationale for this study.

AIM

To describe the evolution of laparoscopic procedures at Chris Hani Baragwanath Hospital (CHBAH) from 2014 to 2018.

Study Objectives

1. To describe the percentage of various laparoscopic procedures at CHBAH from 2014 to 2018.
2. To describe the types of laparoscopic procedures performed at CHBAH from 2014 to 2018

Study site

This will be a single center, retrospective cross sectional study undertaken at Chris Hani Baragwanath Hospital (CHBAH), Johannesburg, South Africa. This is the largest hospital in Gauteng Province with nearly 3000 beds.

Study Design

This will be a descriptive study of the profile and frequency of laparoscopic surgical procedures performed in the adult population at CHBAH.

Analysis plan

Data will be collected from theater registry, and will include all laparoscopic and open procedures performed in the study period. The data collected will be recorded in Excel and statistical analysis will be performed using STATISTICA. The number of procedures

overtime will be reported and presented as tables and graphs. Significant changes overtime will be determined using the Chi-squared test.

Inclusion criteria

All emergency and elective procedures that were performed by laparoscopic and open surgery as well as the conversion rate.

Exclusion criteria

Patients who underwent laparoscopic surgery in the department of paediatric surgery. In our setting all children 10 years and older are managed under adult general surgery.

Benefits and Risks

There are no direct benefits of this study to the patients. However, we hope that the results will help influence hospital policy regarding the use of laparoscopic surgery, and hopefully benefit patients in the future. The risks of this study include loss of patient information. We will minimize this risk by using de-identified patient information which will be stored in a password protected computer only known to the Principal Investigator (PI) and her immediate Supervisor.

Data collection tool

The Patient Demographics

Patient ID…….. Age……. Gender……..

Procedure type: **Date of procedure:**

Elective general surgery Elective thoracic surgery

Emergency general surgery Emergency trauma surgery

Procedure	Elective	Emergency
CHOLECYSTECTOMY		
APPENDICECTOMY		
ANTI-REFLUX PROCEDURES		
INGUINAL HERNIA		
SPLENECTOMY		
ADRENELECTOMY		
DIAGNOSTIC LAPAROSCOPY		
THYMOMECTOMY		
THORACOSCOPIES		
PERFORATED PEPTIC ULCER DISEASE		

Ethical consideration and informed consent

Ethical clearance will be sought from the Human Ethics Committee of the University of the Witwatersrand and the Research Review Board of CHBAH. The data will be de-identified. The process of de-identification will involve assigning each record a specific number ("study ID number").

Study timeline

	2019						2020
	JAN-MARCH			APR-MAY	JUN-AUG	SEP-DEC	JAN-MAR
Literature review							
Preparing tool							
Protocol assessment							
Ethics application							
Data collection							
Thesis write up							
Submission							

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