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SURVEY

Uptake of laparoscopy after intensive training in minimal access surgery during general surgical programme at Sefako Makgatho Health Sciences University

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Background: The proven advantages of minimal access surgery (MAS), such as laparoscopy, are globally recognised. However, its adoption is variable in all countries irrespective of income level. One of the commonly cited barriers is lack of training. This study assesses the uptake of laparoscopy following intensive MAS training in the general surgical program at Sefako Makgatho Health Sciences University (SMU).
Methods: Surveying general surgeons trained at SMU between 2012 and 2018, who had completed their training at SMU and worked elsewhere thereafter. Questionnaires, distributed post-consent, were analysed descriptively.
Results: Among 22 participants, a 100% response rate was achieved. Prior to training, 86.4% were unable to perform laparoscopic appendectomy; 81.8%, laparoscopic cholecystectomy; 94.5%, laparoscopic bowel repair; and 100%, laparoscopic diaphragmatic injury repair. Post-training, participants judged themselves proficient in all these procedures. Participants are currently performing 53% of cases laparoscopically vs 47% via an open technique, with 35% opting for open surgery despite laparoscopic feasibility. The main barriers to using laparoscopic techniques were medical aid denial (59.1%) and lack of equipment (50%).
Conclusions: Intensive MAS training led to widespread laparoscopic adoption among SMU-trained general surgeons in South Africa. Key obstacles to a laparoscopic approach were medical aid refusal in the private sector and equipment scarcity in the public sector.
Keywords: laparoscopy, minimal access surgery, surgical training, uptake, barriers to laparoscopic surgery

Introduction

The benefits of minimal access surgery (MAS), such as laparoscopy, over open surgery are well established in the literature. These include reduced incidence of surgical site infections, shorter length of hospital stay, quicker recovery to normal activities, reduced blood loss, fewer adhesions, improved cosmesis, and less postoperative pain and opioid use.[1,2] This has led to the consideration of laparoscopy as the standard of care for many procedures over the past decade.[2] Despite this evidence, the rate of adoption of MAS has been highly variable in high-, middle- and low-income countries.[1,3,4] The most cited barrier for adoption of MAS is the lack of training; this is in addition to lack of funds, poor health literacy, the size and/or location of the hospital and the steep learning curve.[1]

Given that a lack of training is a major barrier to MAS adoption, this study aims to assess whether intensive MAS training at Sefako Makgatho Health Sciences University (SMU) leads to higher uptake of a MAS technique in clinical practice among general surgeons. Additionally, the study seeks to identify barriers that may exist to the use of a MAS technique after completion of training.

Methods

Selection and description of participants

This cross-sectional study, making use of both qualitative and quantitative approaches was conducted at SMU, located in the Gauteng province in South Africa. Intensive training in MAS was started at SMU in 2011 after the appointment of a new Head of Department of General Surgery. Surgical training at SMU involves offering MAS (laparoscopy) to all eligible patients as a standard institutional policy. All patients are considered eligible for a MAS technique unless a clear contraindication exists, such as inability to undergo a general anaesthetic or hemodynamic instability. Cases include all trauma, colorectal, upper gastrointestinal tract, endocrine, paediatric, hepatopancreatobiliary and acute surgical cases, and trainees are involved either as the primary surgeon or first assistant. A laparoscopic skills laboratory (supervised and unsupervised) and hosting of multiple workshops focusing on common laparoscopic procedures (e.g. hernia repair, cholecystectomy, etc.) supplement training.

All surgeons completing their surgical training at SMU between 2012 and 2018 were considered for inclusion. Former trainees who refused consent and those who were currently employed at SMU were excluded from study.

Those working for the training institution were excluded to reduce bias due to the institution's inherent partisanship towards laparoscopy.

Data collection and measurements

The list of the graduates who qualified for the study and their contact details were retrieved from the Department of General Surgery records. An anonymous questionnaire (Appendix A) was emailed to the study population after a preceding call to explain the purpose of the study, give assurance of confidentiality, and obtain informed consent. All responses were transferred onto an Excel spreadsheet and double checked for errors after each entry. The researcher minimised non-response from potential participants through repeated telephonic follow-ups and in-person interviews. This effort was crucial due to the small study population, as non-response could have significantly affected the study findings. Variables assessed included surgeon demographics (years post-specialist training, years as a medical officer, and sector of current practice) and laparoscopic competencies (timing of skill acquisition for key procedures, perceived difficulty, and satisfaction with training). Surgical practice patterns were also evaluated, including the proportion of laparoscopic versus open cases during training and current practice. Additionally, the estimated percentage of eligible patients not offered laparoscopy and the reasons for this were recorded (Appendix A).

Data analysis

Descriptive statistics were used, with averages reported for continuous variables (e.g. years in practice, years as a medical officer) and percentages for categorical variables (e.g. employment sector, laparoscopic skill acquisition, difficulty and satisfaction levels, surgical approach proportions, and reasons for not offering laparoscopy).

All statistical analyses were done on Statistical Analysis System (SAS Institute Inc. Carey, NC, USA), Release 9.4 or higher, running under Microsoft Windows for a personal computer.

Results

Demographics

A total number of 35 former trainees completed their training between 2012 and the end of 2018. Of these, 22 met the inclusion criteria with all responding to the survey (100% response rate). The mean number of years after completion

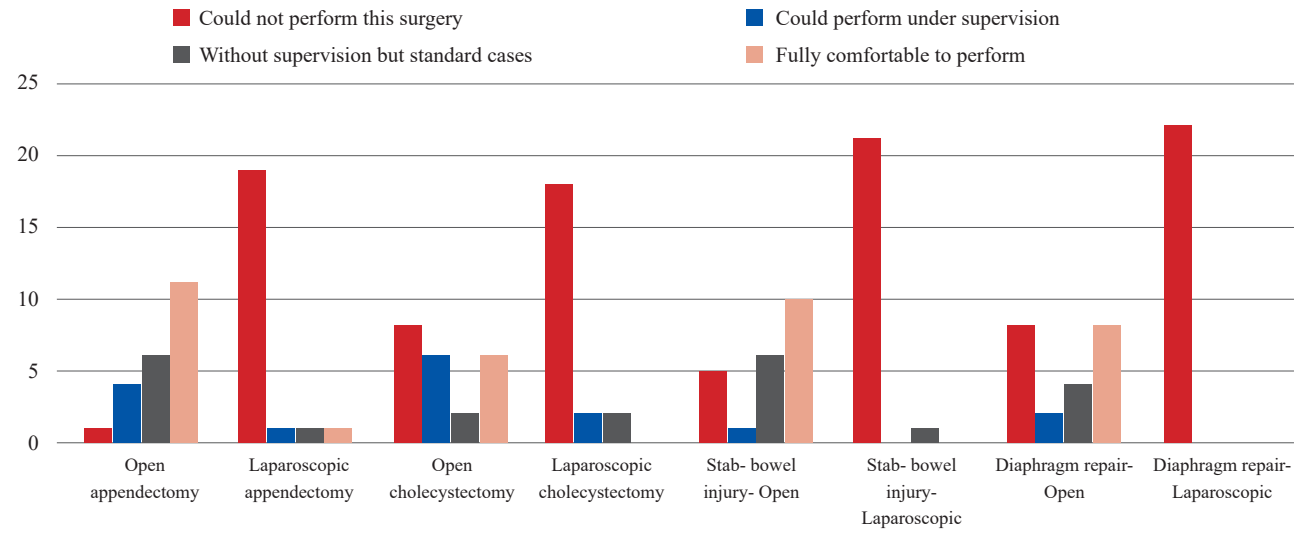

Figure 1: Self-reported surgical expertise before entering the training programme in basic laparoscopic and open surgeries

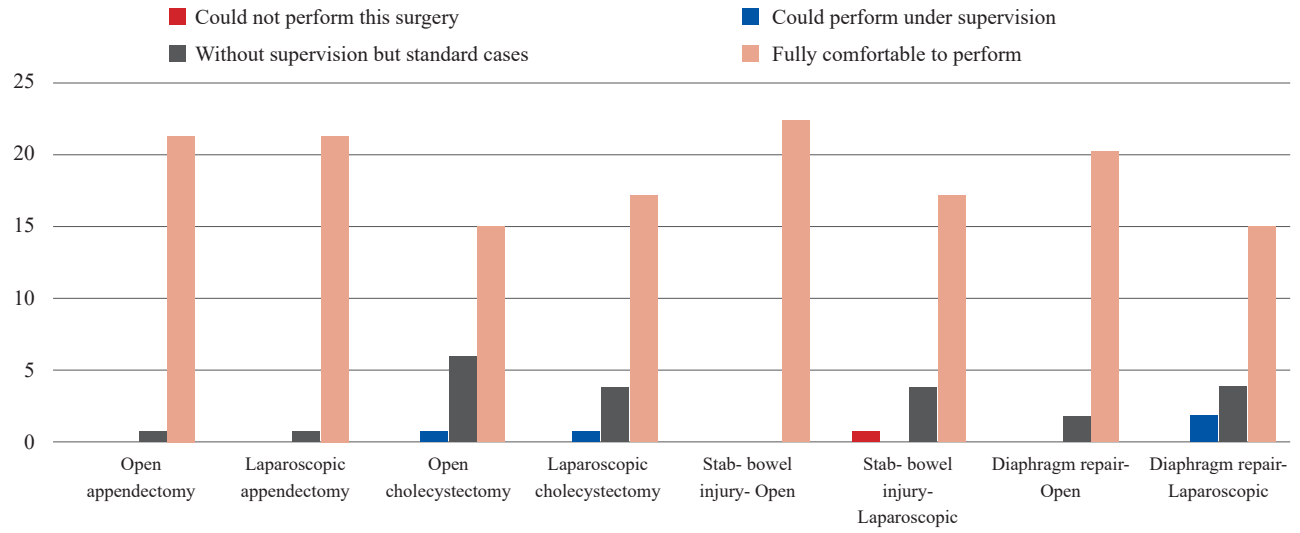

Figure 2: Self-reported surgical expertise at completion of training programme in basic laparoscopic and open surgeries

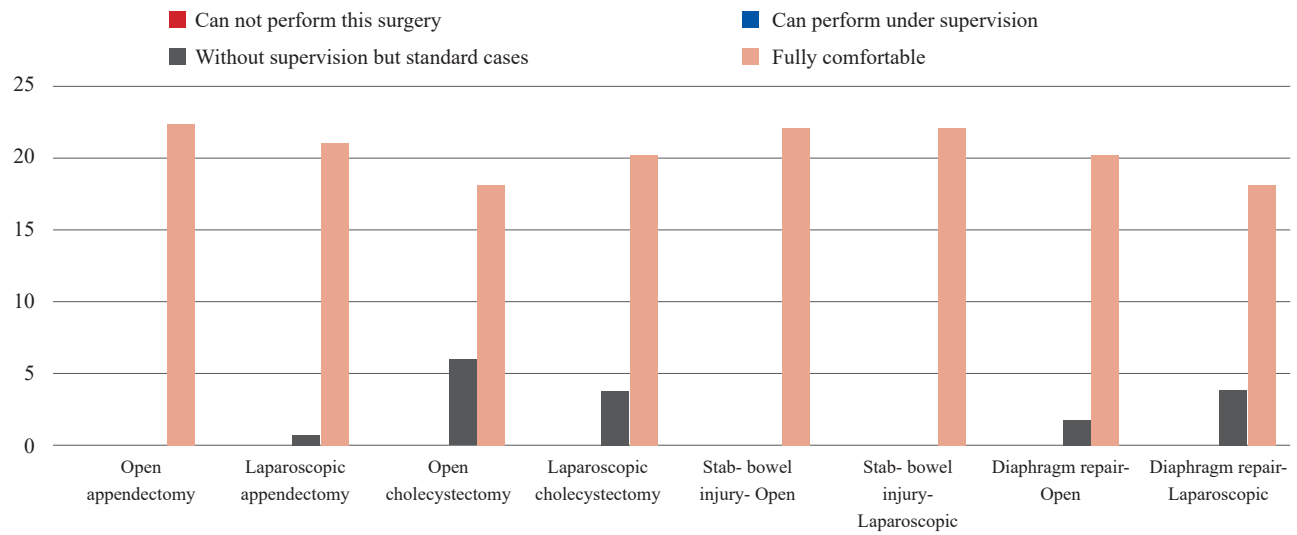

Figure 3: Self-reported current surgical expertise of former trainees in basic open and laparoscopic surgeries

of training was 2.7 years, (range 1 year to 5 years). Half (50%) of the former trainees work in both the public and private sectors, whereas 27.3% and 22.7% work in the public and private sector respectively.

An average of 5 years (range 6 months to 18 years) of surgical experience before starting the general surgery programme was reported. Figure 1 shows the self-reported surgical expertise in basic open and laparoscopic procedures before entering the training programme while Figure 2 depicts self-reported surgical expertise at completion of training.

Figure 3 indicates current self-reported surgical expertise of former trainees at SMU in basic surgical approaches. The reported current average split between laparoscopic and open cases was 53% laparoscopic vs. 47% open when considering all operative cases (not only those eligible for a laparoscopic approach). This is in contrast to 66% laparoscopic vs. 34% open cases performed during training. This equates to a 13% reduction in the proportion of laparoscopic cases. The average percentage of patients offered an open approach despite the possibility of a laparoscopic approach was 35% (range 0% to 90%).

Level of difficulty in learning laparoscopy and level of satisfaction in training

Almost three quarters (72.8%) of the participants found training in laparoscopy to be manageable, 18.2% felt it was difficult and only 9% found it easy. Most participants were either very satisfied (45.5%) or extremely satisfied (18.2%) with training received in laparoscopic surgery.

The emphasis on laparoscopy during training did not negatively affect participants' perceptions of the training they received in open surgery (Figure 4). A significant majority (72.7%) felt that the training they received in open surgery was somewhat satisfactory, very satisfying or extremely satisfying (Figure 5).

Reasons for an open approach

Declined medical aid approval and lack of equipment were the most common reasons for an open approach in patients eligible for a laparoscopic approach, reported by 59.1% and 50% of participants respectively (Figure 6). A total of 18.2% reported lack of expertise, whilst 22.7% reported equipment

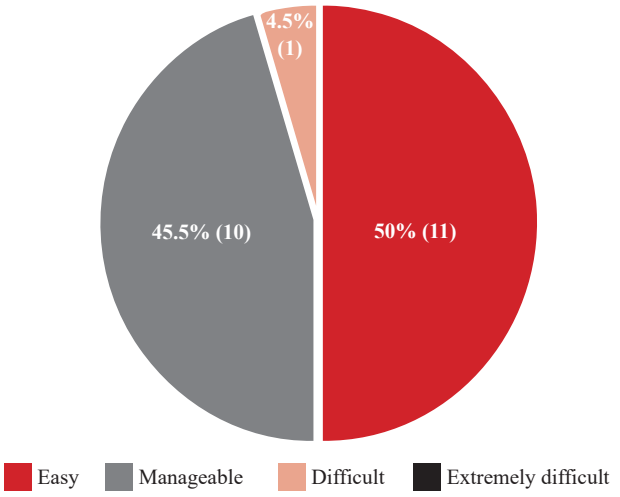

Figure 4: Level of difficulty in learning open surgery during the training programme

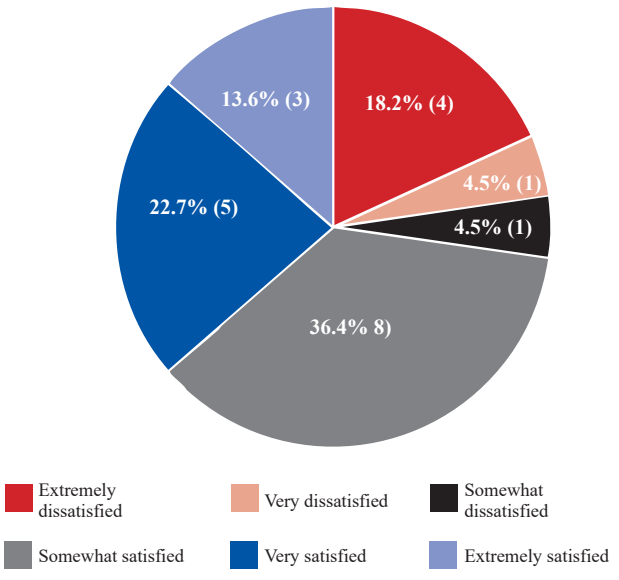

Figure 5: Level of satisfaction with training received in open surgery during surgical training

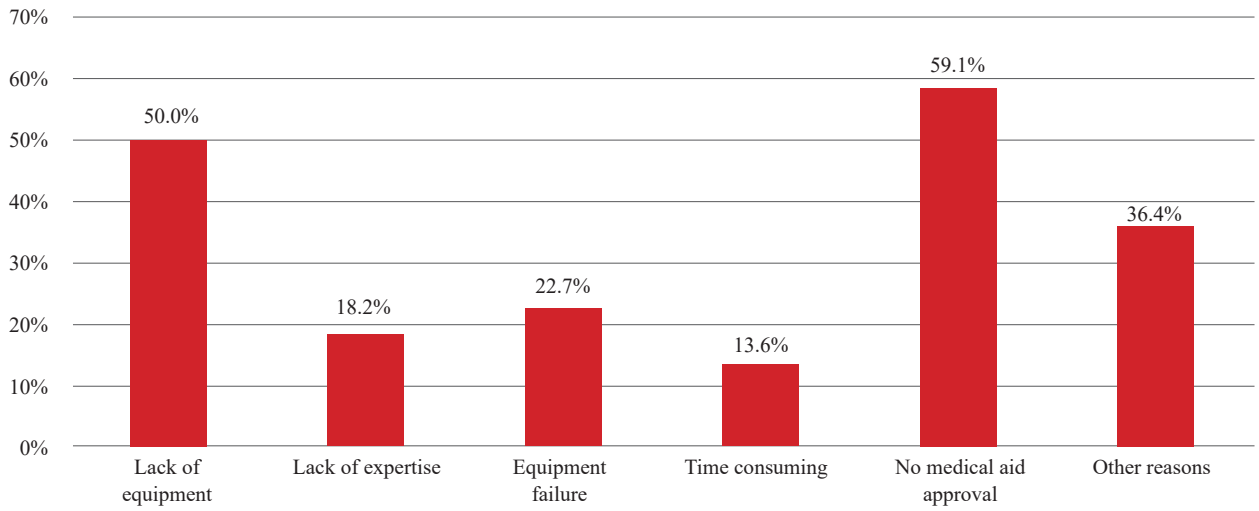

Figure 6: Different reasons for using an open surgical approach despite eligibility for a laparoscopic approach

failure. Long operating times were reported by 13.6% of the participants. Other reasons cited by the participants included resistance from theatre nursing staff and lack of assistance after hours.

Discussion

Our data indicate that intensive training in MAS can result in uptake of a laparoscopic approach in 65% of procedures, with lack of health insurer approval for a laparoscopic approach and lack of access to equipment being the biggest barriers to adoption of a laparoscopic approach after training.

The response rate of 100% from the former trainees was significantly higher than response rates reported in literature exemplified by the response rate in a survey by Shay et al.[5] of 67%. The reason for the high response rate in our study is possibly due to the fewer number of former trainees and the ability to trace all of them without much difficulty. The average number of years since completion of training was 2.7 years in this study and it ranged from 1 year to 5 years. This may be considered a short period but the fact that the competency of the surgeons showed improvement since completion of training suggests that this may not have a negative impact on uptake of laparoscopy. The average of 5 years of surgical experience before starting the general surgery programme suggests that most of these former trainees were experienced in general surgery before starting the programme. However, very few were exposed to laparoscopy before joining the programme. The vast majority could not perform basic laparoscopic procedures. At completion of the training programme, most participants were fully comfortable to perform these procedures. At the time of conduct of this study, the trend for expertise in these surgeries shows more surgeons being fully comfortable in performing laparoscopic procedures. One should note though that comfortability in doing a procedure does not necessarily equate to competence.

Considering the cases that were eligible for a laparoscopic approach, and who were offered this approach, uptake of laparoscopy after intensive training in MAS at SMU was 65%. When considering all operations performed by former trainees, the average split between laparoscopic and open cases was 53% laparoscopic vs. 47% open. This is in contrast to the 66% laparoscopic vs. 34% open cases performed during training. In a recent paper by Yankunze et al.[6] looking at laparoscopic experience in East, Central, and Southern Africa it is worth noting that only 0.9% of the cases performed by surgical trainees in these regions were laparoscopic cases. Therefore, the total of 66% laparoscopic cases during training in SMU is exceptionally higher than other institutions in these regions. Torricelli et al.[2] suggested that full laparoscopic training in medical residence or a fellowship programme is the best way of stimulating laparoscopic dissemination. Shay et al.[5] discovered that urologists who trained in laparoscopy during residency were more likely to perform laparoscopy in their practice. Of those trained in residency, 69% continued to perform laparoscopy after completion of training.[5]

The reduction in laparoscopic cases after completion of training is multifactorial. Lack of equipment in the public sector and medical aid approval in the private sector were reported to be the two major reasons. Other reasons cited included equipment failure, time-consuming procedures, resistance from theatre nursing staff and patients with complex disease requiring complicated procedures. Only 18.2% of the former trainees reported lack of expertise to be the reason for reduced uptake. This suggests that training during residency equipped these surgeons with the necessary skills to perform most basic laparoscopic procedures proficiently. These findings agree with literature on this topic.[2]

The high case load of laparoscopic procedures during training ensured that the former trainees had overcome the steep learning curve at completion of training. This learning curve was cited in the report by Cole et al.[1] as one of the barriers to the uptake of laparoscopy. Interestingly, Jrearz et al.[7] also reported operating time constraints, lack of equipment and lack of adequate training for the uptake of laparoscopy. The lack of medical aid approval seems to be a barrier that is unique to South Africa. This is not cited in literature from other countries and is clearly related to the type of healthcare system in South Africa. An additional barrier reported in the systematic review by Wilkinson et al.[8] showed that the lack of opportunity to practise contributed significantly to the training for laparoscopic cholecystectomy in South Africa and Ethiopia. Therefore, the current setup in the department addressed this indirectly.

Even though South Africa is a middle-income country, it appears that with training in laparoscopy during residency,

the uptake of laparoscopy is high; this would be of great benefit to low- to middle-income countries. Training addresses two of the three major barriers reported by Choy et al.[4] in low- to middle-income countries, namely, the organisational structure for funding laparoscopic procedures, the hierarchical nature of the local surgical culture, and the expertise and skills associated with a change in practice. The hierarchical nature of local surgical culture would change since future trainers would be competent in laparoscopic procedures and would change the practice.

Almost three-quarters (72.8%) of the participants found training in laparoscopy to be manageable, thus indicating that with supervised training and practice, it is not difficult to learn laparoscopy. Most participants were either very satisfied or extremely satisfied with training received in laparoscopic surgery. This indicates that training during residency, which is 5 years, does offer satisfaction to trainees, possibly due the ability to continuously improve laparoscopic skills for many procedures. A significant majority (72.7%) felt that the training they received in open surgery was somewhat satisfactory, very satisfying or extremely satisfying.

The limitations of this study are the self-reported nature of the data with the attendant possibility for recall bias and participants reporting results that may be appealing. The study did not consider patient outcomes or complications which are important aspects to consider when scrutinising any surgical approach. The small study population makes it impossible for one to make strong conclusions, however, we sought to provide insight into the opinions of surgeons who received intensive training in MAS and to pave the way for a quantitative study in the future with a bigger sample size.

Conclusion

This study suggests, despite the small sample size and self-reported data, that intensive training in MAS translated to a high uptake of laparoscopy among general surgeons trained in SMU. The biggest barriers to a laparoscopic approach after training were lack of medical aid approval in the private sector and lack of equipment in the public sector. The authors recommend that a quantitative study with a bigger sample size and a comparison of surgeons trained in other institutions be conducted in the future to validate these findings.

Acknowledgement

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Conflict of interest

The authors report no conflict of interest.

Funding source

No funding was required.

Ethical approval

This research adheres to ethical guidelines, and all procedures were conducted in accordance with the principles set forth by the Sefako Makgatho University Research Ethics Committee. The study protocol was approved under reference number SMUREC/M/242/2019: PG.

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Uptake of laparoscopy after intensive training in minimal access surgery during general surgical programme at Sefako Makgatho Health Sciences University

Annexure 1

Department of General Surgery

Title of Study: Uptake of laparoscopy after intensive training in minimal access surgery during general surgical programme at Sefako Makgatho Health Sciences University (SMU).

Before entering the programme

Surgical experience before entering the programme

1. Years as Medical Officer _____
2. Surgical expertise **before entering the programme**: how comfortably could you perform the following surgeries:

Surgery type	I could not perform this surgery	Under supervision	Without supervision but standard cases	Fully comfortable
Appendectomy				
Open				
Laparoscopic				
Cholecystectomy				
Open				
Laparoscopic				
Stab abdomen for bowel injury				
Open laparotomy				
Laparoscopic				
Thoracoabdominal stab for diaphragm repair				
Open laparotomy				
Laparoscopic				

At completion of the programme

1. Surgical expertise **at graduation**: how comfortably could you perform the following surgeries:

Surgery type	I could not perform this surgery	Under supervision	Without supervision but standard cases	Fully comfortable
Appendectomy				
Open				
Laparoscopic				
Cholecystectomy				
Open				
Laparoscopic				
Stab abdomen for bowel injury				
Open laparotomy				
Laparoscopic				
Thoracoabdominal stab for diaphragm repair				
Open laparotomy				
Laparoscopic				

1. How difficult for you was your training?

in laparoscopy:	Easy	Manageable	Difficult	Extremely difficult
in open surgery:	Easy	Manageable	Difficult	Extremely difficult

2. Were you satisfied with training received during the programme? (**at the time of graduation**)

In laparoscopy:

	Extremely dissatisfied	Very dissatisfied	Somewhat dissatisfied	Somewhat satisfied	Very satisfied	Extremely satisfied	

Open surgery:

	Extremely dissatisfied	Very dissatisfied	Somewhat dissatisfied	Somewhat satisfied	Very satisfied	Extremely satisfied	

1. Overall % split between laparoscopic/open surgery **during the programme** (for example 50% laparoscopic/50% open)

Laparoscopy _____% / open surgery _____ %

After leaving the programme, independent practice

1. Years **after exiting** the programme _____
2. Current work sector: public only/ private only/ public and private
3. Your **current** surgical expertise: how comfortably can you perform the following surgeries:

Surgery type	**I could not perform this surgery**	**Under supervision**	**Without supervision but standard cases**	**Fully comfortable**
Appendectomy				
Open				
Laparoscopic				
Cholecystectomy				
Open				
Laparoscopic				
Stab abdomen for bowel injury				
Open laparotomy				
Laparoscopic				
Thoracoabdominal stab for diaphragm repair				
Open laparotomy				
Laparoscopic				

4. Overall % split between laparoscopic/open surgery **currently** (for example 50% laparoscopic/50% open)

Laparoscopy _____% / open surgery _____ %

Percentage of patients offered an open operation despite clinical scenario that allows for laparoscopic approach _____%

Reasons for open approach

Lack of expertise	Equipment failure	Lack of equipment
Time consuming	No medical aid approval	Other: