

Experience and perceptions of laparoscopic appendectomy amongst surgical trainees in South Africa

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Background: This study is a survey amongst surgical trainees in South Africa (SA) designed to document their exposure to laparoscopic appendectomy (LA) and their perceptions about the procedure and to identify possible barriers to its uptake.

Methods: A structured survey was developed using a combination of quantitative and qualitative questions designed to determine the clinical exposure of surgical trainees to laparoscopic appendectomy and then probe possible factors limiting their access to the procedure. A questionnaire was created online, and a link was distributed to various surgical trainees in Southern Africa. A list of trainees was obtained from the Surgreg Training Association of South Africa (STA).

Results: One hundred and thirty-two (47%) trainees completed the survey out of an estimated 280 general surgery registrars. Ninety-five (72%) were male and 37 (28%) were female respondents. Their median age was 31 years (25–36). There were 14 (11%) year-1 and 21 (16%) year-2, 32 (24%) year-3, 37 (28%) year-4 and 28 (21%) year-5 trainees. The breakdown according to region was area 1 (inland and central) 47 (36%), area 2 (western seaboard) 12 (9%) and area 3 (eastern seaboard) 73 (55%). Forty-three (33%) respondents experienced face-to-face teaching on how to perform a LA. Forty-two (32%) had exposure to laparoscopic simulators. Respondents reported a general lack of experience in performing this procedure. Sixty-nine (52%) had performed this procedure without a senior (i.e., solo) and 13 (10%) had only assisted a senior to perform this procedure. Seventy-four (56%) respondents felt confident performing a LA independently. One hundred and thirteen (86%) respondents expected to be taught this procedure. One hundred and five respondents (80%) were keen to learn to perform LA. One hundred and five respondents (80%) stated that they would be interested in attending an online course on LA. The respondents felt that the following were the significant barriers to performing LA: resource constraints 49 (37%) and time constraints 46 (35%). Thirty per cent of respondents (22) in area 3 reported a reluctance by seniors to teach the procedure.

Conclusion: There appears to be a lack of exposure to and confidence with LA amongst South African surgical trainees. This implies a deficiency in formal surgical training programmes. Addressing this deficiency will require innovative solutions.

Keywords: appendectomy, appendicitis, complications, surgery, epidemiology

Introduction

Acute appendicitis (AA) is the commonest surgical emergency globally and in South Africa (SA).^{1,2} According to international guidelines, the recommended treatment for AA is laparoscopic appendectomy (LA).³ In high-income countries (HICs) such as the UK and the USA, AA is managed predominantly by LA and is associated with low morbidity and mortality.¹ However, in South Africa, AA is still associated with significant morbidity and mortality.^{2,4,5}

SA has a dual healthcare system, and the approach to AA varies between the public and private sectors.⁵⁻⁷ Most AA is managed by a formal laparotomy or an appendectomy via a local incision.^{2,4,6} The rate of LA in the public sector, however, is increasing. A recent study from a major public healthcare centre in KwaZulu-Natal (KZN) observed an

increase in their LA rate from 3% in 2012 to close to 25% in 2019.⁸ Nonetheless, this rate remains well below the rest of the world, rating LA at 51.7%.¹ Conversely, in the private sector in SA, the preferred surgery for AA is LA. The LA rate in the private healthcare sector is 66.5% which is above the world average rate but is significantly below HICs which have a rate above 90%.^{2,9-11}

A proposed explanation for the difference in LA rate in the public and private sectors is the severity of the disease at presentation. Patients treated in the public sector tend to present later and experience delays in reaching and accessing healthcare.⁷ Therefore, public sector patients have more advanced disease with a higher incidence of perforation. However, the 2020 update of the World Society of Emergency Surgery (WSES) Jerusalem guidelines

strongly recommend LA as the preferred approach for both uncomplicated and complicated AA.³ Therefore, the predominant surgery for AA should be LA in both the public and private sectors in SA.

The causes of the low LA rate in the public sector are multifactorial, but a key consideration is the proficiency of surgeons to perform the procedure. LA is a skilled procedure that requires dedicated training and extensive practice for proficiency. A lack of adequate exposure to and training in LA would contribute to surgeons preferring to perform the open approach for AA. Against this background, a survey of surgical trainees was conducted to document their exposure to LA and assess their perception of their training and competency in this procedure. The study also identified possible barriers to the uptake of LA in the public healthcare sector.

Methods

A literature review was conducted on AA in SA since the turn of the millennium. This was used to generate several queries which were refined using a modified Delphi-type discussion. A mixed-methods survey was formulated. Quantitative questions were designed to determine the clinical exposure of surgical trainees to LA and qualitative questions were employed to assess possible factors limiting exposure to the procedure.

The questionnaire was created online and a link was distributed to various trainee surgeons in SA. A list of surgeons was obtained from the Surgreg Training Association of South Africa (STA). Reminder emails were sent to the trainee surgeons on the list.

For analytical purposes, the country was divided into three geographical areas: area 1: central and inland, area 2: western seaboard, and area 3: eastern seaboard. This study obtained ethics committee approval. The survey is attached as an appendix.

Results

One hundred and thirty-two trainees (47%) completed the survey out of an estimated total of 280 general surgery registrars throughout the country. Ninety-five (72%) were male and 37 (28%) were female respondents. Respondents ranged from 25 to 36 years and the mean age was 31 years. Responses were received from trainees across the training programme with 14 (11%) year-1, 21 (16%) year-2, 32 (24%) year-3, 37 (28%) year-4 and 28 (21%) year-5 trainees. Responses were received from all three areas, with 47 (36%) from area 1, 12 (9%) from area 2 and 73 (55%) from area 3.

Most respondents were aware that AA could be managed by LA. One hundred and twenty respondents (91%) had watched a video or read about the procedure, and 43 (33%) respondents had received face-to-face teaching on

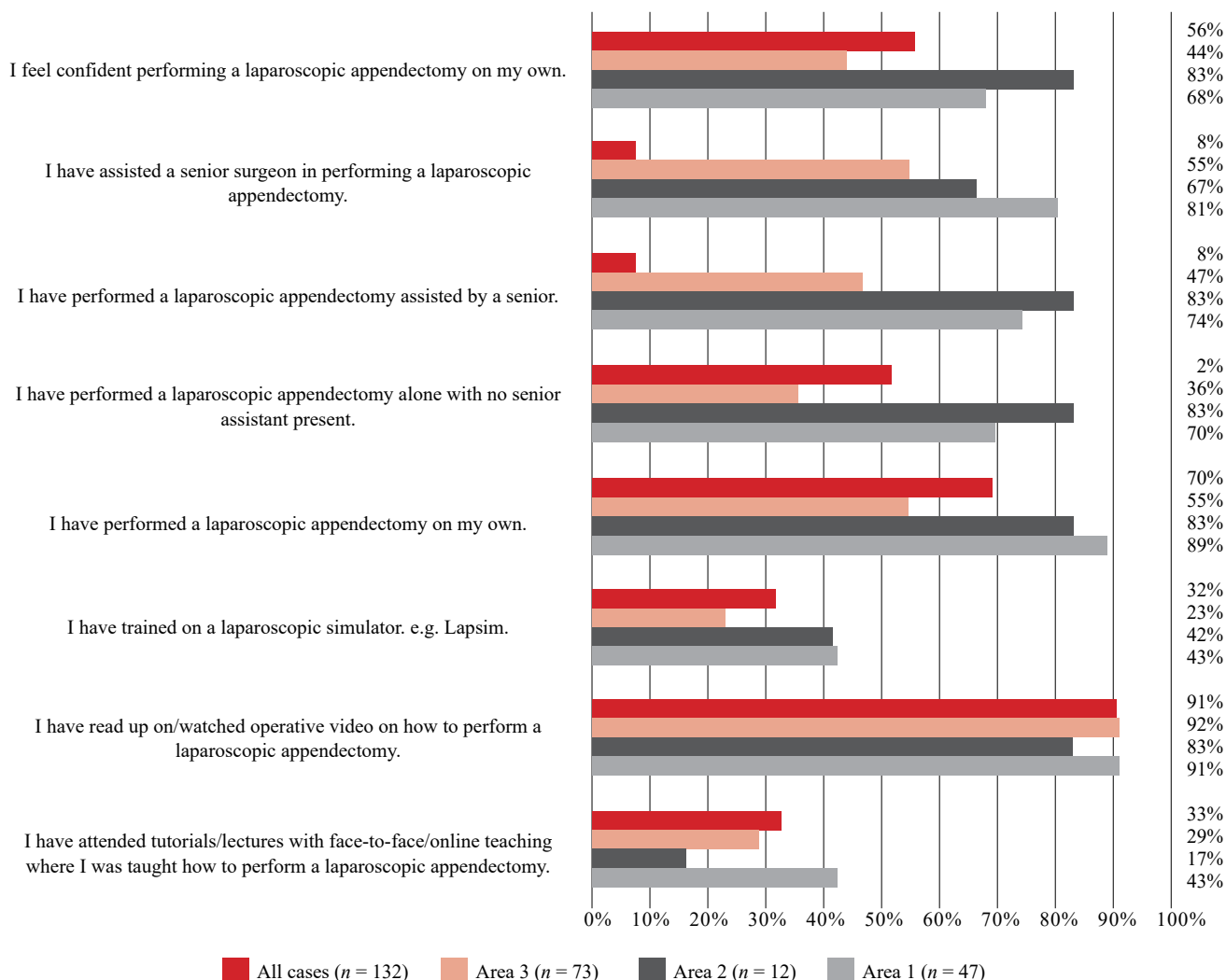


Figure 1: Training an experience of respondents

how to perform a LA. Forty-two respondents (32%) had practiced the procedure with laparoscopic simulators and 92 respondents (70%) had been involved in the performance of the procedure in theatre (scrubbed in).

The highest skills levels demonstrated by respondents ranged from assisting in the procedure to performing the procedure as the primary surgeon. Sixty-nine respondents (52%) had conducted the procedure without the assistance of a senior, while 10 respondents (8%) had only performed the procedure under the supervision of a senior colleague. Thirteen respondents (10%) had only assisted a senior to perform the operation and 40 respondents (30%) had never participated in the performance of a LA (Figure 1).

Although 92 respondents (70%) had participated in the performance of a LA, only seventy-four respondents (56%) were confident in their ability to perform the procedure independently. Fifty-eight (44%) respondents lacked the confidence to perform a LA. Fifty-five (95%) of these respondents acknowledged that LA was an important skill and wanted to learn the procedure.

Most respondents had a basic understanding of LA, and 113 respondents (86%) expected to be taught the procedure during their training. One hundred and five respondents (80%) were keen to learn and perform LA, while 16 respondents (12%) were indifferent and 11 respondents (8%) were not interested in learning the procedure. One hundred and five respondents (80%) expressed an interest in attending an online course on LA.

As identified by the surgical trainees surveyed, the main barriers to LA were resource constraints (49; 37%) and time constraints (46; 35%). This was consistent across all three areas. Forty-three respondents (33%) identified a lack of skills as a significant barrier to the uptake of LA. However,

this varied significantly between regions, ranging from 2 (17%) in area 2 to 13 (28%) in area 1 and 28 (38%) in area 3. Twenty-two respondents (30%) in area 3 identified a reluctance by seniors to teach the procedure as being a barrier to LA uptake. The situation was significantly better in area 2 with a reported incidence of two (17%) and area 1 with an incidence of seven (15%), resulting in an overall reporting rate of 31 respondents (23%) across all three regions. Respondents identified after-hours presentation (30; 23%) as a more significant barrier to LA than advanced disease presentation (14; 11%). This was consistent across all three regions. Resistance to the procedure from other clinical staff, e.g., nurses and anaesthetists, was identified as a minor barrier with reporting ranging from 1 (8%) in area 2 to three (6%) in area 1 and six (8%) in area 3, resulting in an overall reporting rate of 10 (8%) (Figure 2).

Discussion

AA is the commonest abdominal emergency both globally¹ and locally,⁸ and its incidence in SA is increasing.¹² If diagnosed and treated appropriately, AA has excellent outcomes. However, morbidity increases rapidly if there is a delay in treatment.^{3,4,13} Furthermore, there are well-documented significant discrepancies in the disease outcome depending on patients' racial, economic and geographical profiles.¹⁴ The introduction of LA, over three decades ago, has added a further confounder to the discussion about discrepancies in outcomes for this common disease.

International guidelines, including the WSES Jerusalem guidelines, recommend LA as the preferred treatment for AA.³ LA is recommended for both uncomplicated and complicated appendicitis. The procedure is safe and is associated with better outcomes than open appendectomy.¹⁵ There is a lower incidence of wound infection and patients have a reduced length of hospital stay. The minimally invasive nature of the procedure results in less postoperative pain and earlier return to work.^{16,17}

There has been widespread uptake of the laparoscopic approach in HICs. It is the standard operation that most patients undergo.^{1,9} A recent study by Melmer et al. in the USA questions whether open appendectomy is "in danger of extinction." General surgery trainees (residents) in HICs are experiencing the inverse problem to trainees in SA. American surgical trainees perform > 90% of appendectomies laparoscopically and are in danger of not achieving enough open appendectomies to ensure proficiency. AA in HICs is associated with very low levels of morbidity and mortality.¹¹

In SA, the uptake of LA has been heterogeneous. It is the standard approach in private practice, but its uptake is less consistent in the public healthcare sector.^{2,5,7} There are several reasons for the significantly lower rate of LA in the public sector. This study investigated possible barriers to the performance of LA in the public sector. The main barriers were resource constraints, time constraints and a lack of skills. In some areas, registrars reported a lack of willingness on the part of seniors to teach the procedure. Less significant barriers included after-hour presentation and advanced disease. Interestingly, after-hour presentation was a greater barrier than advanced disease.

Forty-nine respondents (37%) identified resource constraints as a significant barrier to the performance of LA. The surgical registrars are trained at regional and tertiary hospitals which have access to laparoscopic equipment.

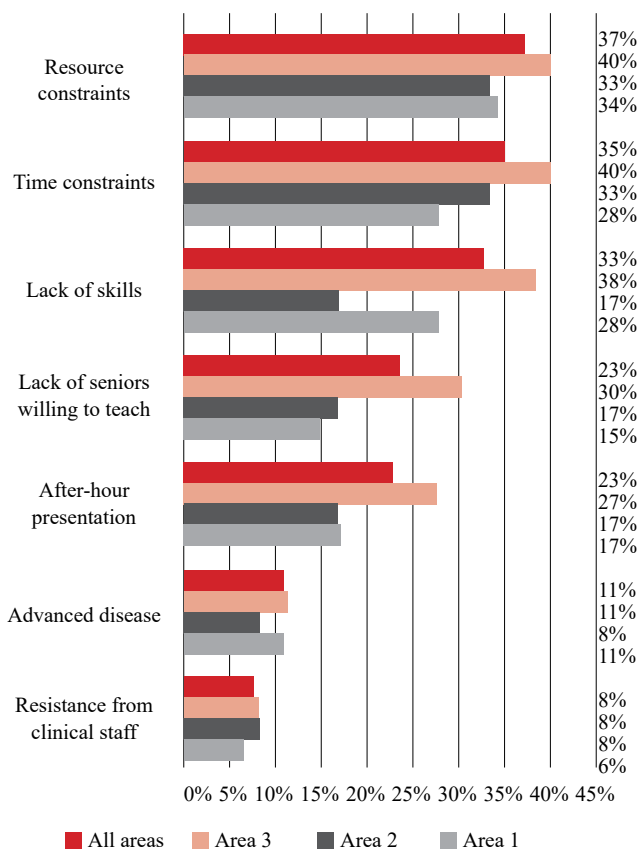


Figure 2: Main barriers to laparoscopic appendectomy

However, the laparoscopic equipment is shared by several departments and availability is an issue. This is compounded by frequent equipment failure and long turn-around times for the repair of laparoscopic equipment. Furthermore, a shortage of disposable items, such as trocars, and a lack of specialised consumables, such as endoloops (pretied sutures), prevent the performance of LA. In comparison, open appendectomy does not require any specialised equipment and is therefore the procedure of choice when resources are constrained.

Forty-six respondents (35%) identified time constraints as a significant barrier to the performance of LA. Open appendectomies have a shorter setup time and a shorter operative time than LA. Furthermore, the operative time increases significantly when the surgeon is supervising a trainee to perform LA. Public hospitals have a large burden of disease and there are always surgical emergencies waiting to be operated on. Theatre time is a precious commodity and surgeons are under pressure to perform surgeries in a time efficient manner.

Both resource constraints and time constraints are significant barriers to the performance of LA in the public sector. In contrast, the private sector serves a much smaller portion (15% vs 85%) of the population and is very well resourced.⁶ Theatre time is also readily available in the private sector. The absence of resource and time constraints contributes to the high rate of LA in the private sector with 66.5% of all AA treated by LA.⁵

Forty-three respondents (33%) identified a lack of skills as a significant barrier to the uptake of LA. This was consistent with the results of the trainee survey which revealed a low proficiency in performing LA. Of the 132 respondents in the survey, only 56% were confident in their ability to perform the procedure. This lack of proficiency was due to inadequate formal teaching and a low exposure rate to LA. This was evidenced by the fact that only 33% of respondents had received face-to-face teaching, while 32% had practiced the procedure with laparoscopic simulators. Only 70% of respondents had been involved in the performance of the procedure in theatre. This level of exposure and formal teaching is inadequate to produce surgeons who are proficient in the procedure, impacting the performance rate of LA in public hospitals. These surgeons lack the confidence and proficiency to perform LA and will therefore manage all AA by open appendectomy/laparotomy.

The low exposure to LA was in contrast to surgical trainees' expectations and desires. Most respondents were aware that AA could be managed by LA and had expected to be taught the procedure during their training. Respondents acknowledged that LA was an important skill and expressed a strong desire to learn the procedure. They had read up about the procedure, watched videos and had expressed an interest in attending an online course on LA.

In the MAGIC study, Gomes et al. observed that the higher the country's income, the greater the capacity of the healthcare system to offer better technology.⁹ The public healthcare sector in SA does indeed have the available technology as the laparoscopic approach for cholecystectomies is the standard of care. It is also considered an operation where surgical trainees are expected to be proficient early in their careers.

The current literature suggests that the performance of LA is widespread in private practice in SA.⁵ This indicates

a training gap, as most private surgeons in the country will have received their training in the South African state sector, implying that laparoscopic training in South Africa is happening outside the formally established training system.

Our results should be viewed considering certain limitations. Although multi-institutional, our sample number is relatively small. Furthermore, the responses from the eastern seaboard outweigh answers from central areas and from the western seaboard. Our response rate was 132, 47% of all current South African general surgery registrars ($n = 280$). This study focused only on appendectomy. Other operations are amenable to the laparoscopic approach, and general surgery trainees are also possibly deficient in their training therein. In all general surgical procedures, exposure to laparoscopy should be evaluated in the South African training context.

Addressing this deficit in training will require a multi-faceted set of interventions. These will include the increased use of surgical simulators and online training platforms to teach the basics of LA. Improving access to laparoscopic equipment and reaffirming the importance of training in basic laparoscopic surgery are vital. The three main barriers to LA in SA will have to be addressed simultaneously to improve the rate of LA.

Conclusion

LA is the recommended treatment for AA but South African public sector hospitals have a low rate of LA. Time and resource constraints as well as a lack of skills are the major barriers to the performance of LA. The lack of skills is due to insufficient exposure to LA amongst SA surgical trainees. Although trainees are keen to learn and perform the procedure, inadequate teaching and training have resulted in SA trainees lacking confidence in performing the LA procedure. This implies a deficiency in the formal surgical training programmes. Addressing this deficiency will require innovative solutions. If ignored, South African trainees may well fall behind their international peers in terms of familiarity with and competence in laparoscopic surgery.

Conflict of interest

The authors declare no conflicts of interest.

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Ethical approval


This study was approved by the Biomedical Research Committee (BREC) of the University of KwaZulu-Natal (UKZN) Protocol reference no. BREC/00001555/2020.

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