

GENDER SPECIFIC OPERATIVE EXPERIENCE DURING TRAINING IN AN ACADEMIC GENERAL SURGERY UNIT

By

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Table of Contents

CHAPTER 1:

PROTOCOL.....	5
a. Purpose of the study.....	6
b. Background.....	6
c. Methodology.....	7
d. References.....	10

CHAPTER 2:

LITERATURE REVIEW.....	13
References.....	17

CHAPTER 3:

PUBLICATION READY MANUSCRIPT

1. Abstract.....	21
2. Article.....	22
a. Introduction.....	22
b. Methodology.....	23
c. Results.....	24
d. Discussion.....	26
e. Conclusion.....	28
f. Tables.....	29
g. References.....	32

CHAPTER 4:

Appendices

Letter-Faculty Research Ethics Committee	36
Instructions to Authors of SAJS.....	37

CHAPTER 1: PROTOCOL

Title

Gender specific operative experience during training in an academic general surgery unit

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Purpose of the study

The aim of this study was to enumerate the differences in operative experience afforded to female and male surgical trainees in the Acute Care and General Surgery Unit of the Division of General Surgery at Groote Schuur Hospital.

Background

The increase in the ratio of female to male medical student admissions have been described since the beginning of the millennium.^{1, 2} This change has also occurred in South Africa.³

The inevitable increase in the number of female individuals pursuing a career in surgery has highlighted the difficulties inherent in this process.⁴ This has also been examined in scholarly work, and even expressed via social media.⁵⁻⁷

The bias against women in all vocations, including medicine, is still well entrenched.^{8, 9} Women, moreover, underestimate and devalue their abilities and capabilities in the healthcare setting.¹⁰⁻¹³ This despite research showing no difference in performance, including in male-dominated specialties such as Orthopaedic Surgery.^{6, 14} Gender has furthermore been described as a risk factor in the attrition rate of surgical trainees.¹⁵

The effect of gender bias in the operating room during training has been examined to a lesser extent. Reports have been published showing a significant bias against female residents.^{16, 17} Furthermore, it is unknown if gender bias is expressed in terms of equal opportunity to gain operative experience.

During their training, registrars in General Surgery complete a three or six month rotation through the Acute Care and General Surgery Unit in the Division of General Surgery at Groote Schuur Hospital, Cape Town.¹⁸ The aim of this research project is to enumerate the differences in operative opportunity provided to female and male trainees during this rotation, which may be an indicator of possible bias against female trainees.

Methodology

Study design

Retrospective cross-sectional study.

Characteristics of the study population

Data was collected on registrars in the Division of General Surgery who completed a rotation in the Acute Care and General Surgery Unit at Groote Schuur Hospital between April 2015 and September 2017.

Recruitment and enrollment

Not applicable.

Research procedures and data collection methods

Retrospective data was collected from theatre records for the period April 2015 to September 2017. Data point values for the following variables were collected (sample space in parentheses):

1. Primary surgeon gender (female trainee / male trainee / consultant)
2. First assistant (female trainee / male trainee / consultant)
3. Patient age (integer value for years)
4. Patient gender (female / male)
5. Type of surgery (elective / emergency)
6. Colour code of emergency booking (green / yellow / orange / red)
7. General anesthesia (yes / no)
8. Procedure type (major (defined as general anesthesia and duration more than 30 minutes) / minor (defined outside of parameters of major procedure))
9. Duration of procedure (integer value for minutes)
10. Place of postoperative care (ward / high care / intensive care)

Data safety and monitoring

Anonymous data point values for the variables listed above will be captured in a spreadsheet file and will only be available to the principal investigator.

Data analysis

Data analysis will be performed using the Jupyter kernel of IPython with the following libraries: numerical python, scientific python, statsmodels, and scikit-learn.¹⁹⁻²² Data will be managed by the pandas library and all plotting will be based on the matplotlib library.^{23, 24}

Descriptive statistics will include point estimates (mean, median, mode) and measures of dispersion (standard deviation, range, quantiles) for continuous variables, and frequencies with percentage for categorical variables.

Ordinal categorical variables will be analysed by the chi-squared test for independence. Ordinal categorical variables will be analysed by nonparametric tests.

Numerical variables will be analysed by parametric and nonparametric test as indicated by the Shapiro-Wilk test for normal data distribution. The Bartlett test will be used to distinguish equal from non-equal variance groups.

A confidence levels of 95% will be used throughout. Unless otherwise indicated, a two-tail test hypothesis will be used with an alpha-value of 0.05 as discriminator for rejection of the null-hypothesis.

Primary analysis:

X^2 test for proportions (comparing male and female percentages)

1. Major surgery
2. Minor surgery
3. Laparoscopic surgery
4. Primary surgeon
5. First assistant
6. Elective surgery
7. Emergency surgery
8. Each colour code
9. Each place of postoperative care

Secondary analysis:

1. Descriptive analysis of variables listed above.

Description of risks and benefits

The retrospective nature of the study design infers no risk. The purpose of this study is to identify any gender bias in the operative experience afforded female and male trainees. If such bias exists, this study might aid in addressing such bias.

Informed consent process

Not applicable.

Privacy and confidentiality

The data collected will be anonymous and only available to the principal investigator.

References

1. Heru A. Pink-collar medicine: Women and the future of medicine. *Gend Issues* 2005. DOI: 10.1007/s12147-005-0008-0.
2. Barzansky B and Etzel SI. Educational Programs in US Medical Schools, 2002-2003. *JAMA* 2003. DOI: 10.1001/jama.290.9.1190.
3. Breier M and Wildschut A. Changing gender profile of medical schools in South Africa. *S Afr Med J* 2008.
4. Waljee J, Chang K, Kim H, et al. Gender Disparities in Academic Practice. *Plastic and Reconstructive Surgery* 2015. DOI: 10.1097/PRS.0000000000001530.
5. Wendel TM, Godellas CV and Prinz RA. Are there gender differences in choosing a surgical career? *Surgery* 2003. DOI: 10.1016/S0039.
6. Van Heest AE and Agel J. The uneven distribution of women in orthopaedic surgery resident training programs in the United States. *J Bone Joint Surg Am* 2012. DOI: 10.2106/JBJS.J.01583.
7. Logghe H. #ILookLikeASurgeon Tweet it. Own it.
8. Phillips NA, Tannan SC and Kalliainen LK. Understanding and Overcoming Implicit Gender Bias in Plastic Surgery. *Plast Reconstr Surg* 2016. DOI: 10.1097/PRS.0000000000002668.
9. Corinne A. Moss-Racusin, John F. Dovidio, Victoria L. Brescoll, et al. Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of*

Sciences 2012. DOI: 10.1073/pnas.1211286109.

10. Nebeker CA, Basson MD, Haan PS, et al. Do female surgeons learn or teach differently? The American Journal of Surgery 2017. DOI: 10.1016/j.amjsurg.2016.10.010.
11. Shipman, Katty Kay and Claire. The Confidence Gap. The Atlantic 2014.
12. Minter RM, Gruppen LD, Napolitano KS, et al. Gender differences in the self-assessment of surgical residents. Am J Surg 2005. DOI: 10.1016/j.amjsurg.2004.11.035.
13. Flyckt RL, White EE, Goodman LR, et al. The Use of Laparoscopy Simulation to Explore Gender Differences in Resident Surgical Confidence. Obstet Gynecol Int 2017. DOI: 10.1155/2017/1945801.
14. Pico K, Gioe TJ, VanHeest A, et al. Do Men Outperform Women During Orthopaedic Residency Training? Clin Orthop Relat Res 2010. DOI: 10.1007/s11999-010-1318-4.
15. Yeo HL, Abelson JS, Mao J, et al. Who Makes It to the End? A Novel Predictive Model for Identifying Surgical Residents at Risk for Attrition. Ann Surg 2017. DOI: 10.1097/SLA.0000000000002384.
16. Dresler CM, Padgett DL, MacKinnon SE, et al. Experiences of women in cardiothoracic surgery. A gender comparison. Arch Surg 1996.
17. Lichtenstein J. The Effect of Gender on Resident Autonomy in the Operating room. Journal of Surgical Education 2017. DOI: 10.1016/j.jsurg.2017.10.009.
18. Klopper J, Rayamajhi S, Venter J, et al. Provision of acute and elective general surgical care at a tertiary facility in the era of subspecialisation 2017.

19. Pedregosa F, Varoquaux G, Gramfort A, et al. Scikit-learn: Machine Learning in Python. *Journal of Machine Learning Research* 2011.
20. Kumbhani D. A framework for streamlining research workflow in neuroscience and psychology. *Frontiers in neuroinformatics* 2013.
21. Walt Svd, Colbert SC and Varoquaux G. The NumPy Array: A Structure for Efficient Numerical Computation. *Computing in Science & Engineering* 2011. DOI: 10.1109/MCSE.2011.37.
22. Pérez F and Granger BE. IPython: A System for Interactive Scientific Computing. *Computing in Science & Engineering* 2007. DOI: 10.1109/MCSE.2007.53.
23. McKinney W. Python for data analysis, <http://conference.scipy.org/proceedings/scipy2010/mckinney.html> (2012).
24. Hunter JD. Matplotlib: A 2D Graphics Environment. *Computing in Science & Engineering* 2007. DOI: 10.1109/MCSE.2007.55.

CHAPTER 2: LITERATURE REVIEW

“I come here today ... to tell you that coeducation has proved an absolute failure, from our standpoint. When I tell you that 33.3 per cent of the ladies, students, admitted to Johns Hopkins Hospital at the end of our short session are to be married, then I tell you that coeducation is a failure.” — William Osler, 1894. ¹

Unconscious bias exists in all vocations, including medicine, and is still well entrenched.^{2,3} Women, moreover, underestimate and devalue their abilities and capabilities in the healthcare setting.⁴⁻⁷ This occurs despite research showing no difference in performance, including in male-dominated specialities such as Orthopaedic Surgery.^{8,9} Gender has furthermore been described as a risk factor in the attrition rate of surgical trainees.¹⁰ The role of gender in the context of operating opportunity during training has been examined to a lesser extent. Reports have been published showing a significant bias against female surgical trainees.^{11,12} A study by Hutchison et al., (n=46 female surgeons) found four types of bias affect women surgeons, namely workplace factors, epistemic injustices, stereotypical expectations by colleagues as well as patients, and objectification.¹³ How this is expressed in terms of equal opportunity for male and female trainees to gain operative experience is not known in the South African setting.

The increase in the ratio of female to male medical student enrolment has been noted since the beginning of the millennium. This includes the number of applications, admissions, and graduations.^{14,15} This trend is evident both internationally and locally.¹⁶ The inevitable increase in the number of female individuals pursuing a career in surgery has highlighted difficulties inherent in this change,¹⁷ which has not only been examined in scholarly work, but also expressed on social media platforms and been the basis for programmes such as the Australian ‘Operating with respect’ course.¹⁸⁻²¹ Females have been noted to strive for a better work – life balance, and are more likely to choose clinical practice rather than research. Some of the reasons for both males and females to resist pursuing a career in surgery include lifestyle whilst training and after qualifying, as well as length of training.¹⁸

Yu et al did a review of the literature from 1991 wanting to determine what factors were integral in female medical students choosing or rejecting a career in surgery. These factors are listed in Table 1.

Incentives	Disincentives
Nature of surgical practice – including the intellectual challenge of surgery, and the ability to witness immediate results	Features of surgical residency and training – including length of training, availability of part-time work, parental leave, competitiveness, time consumption, impact on personal lifestyle
Presence of positive role models	Perception of poor work-life balance
Perception of job satisfaction	Perception or experience of sex-based discrimination, including harassment
Enjoyment of surgical clerkship	Negative experience during surgical clerkship
Selection of a surgical elective	Lack of identifiable role models in surgery
Enthusiastic teachers in surgery	
Anticipated future income	
Expected prestige and career esteem	

Table 1. Factors influencing intentions of medical students to pursue a surgical career.²²

The Japan Surgical Society did a nationwide survey which showed that female surgeons of all ages earn less, irrespective of whether they have children or not, and work fewer hours- including call-outs- than the male surgeons.²³ They also reported on perception scores between male and female surgeons, which were related to discrimination related to work and promotion. The scores were found to be higher among the females than their male counterparts. In the United States, a national survey indicated that 77% of females, during their careers, had experienced gender-based discrimination and harassment.²³ In an international survey it was

determined that females experience career barriers including lack of familial support and gender discrimination, with females in different countries experiencing different career barriers.²⁵

Umoetok et al. looked at female surgical trainees at a local institution, and although the majority of the trainees were satisfied with their career choice, there were some challenges faced by the trainees which included physical threats, emotional threats and being treated differently based on their gender.²⁶ Roodt et al. surveyed the medical students, registrars and consultants in the surgical department at UCT, and found that females faced more challenges and were considered disruptive to the surgical roster, within the general surgical discipline.²⁷

Hoops et al. looked at whether gender affected operative autonomy, during laparoscopic cases. Factors that were controlled for during the analysis included technical performance, the year of training of the trainee, and the case characteristics. It was found that the gender of the senior surgeon did not affect the intra-operative autonomy of the trainee; however, the female trainees received significantly more guidance than their male colleagues.²⁸

During their training, registrars in General Surgery complete a three, or six, month rotation through the Acute Care and General Surgery Unit (ACGSU) in the Division of General Surgery at Groote Schuur Hospital (GSH), University of Cape Town (UCT).²⁹ The model of the unit was based on the trauma care model developed in the 1960's, which showed the benefit for trauma patients being managed by a dedicated team. The need for a dedicated ACGSU at GSH was recognised in 2010. This unit provides dedicated urgent care for surgical patients, instead of the sub-specialisation units managing the patients. The ACGSU duty rosters are designed to allow an equal weekly duty rotation for trainees during their rotation. The roster considers ward work, clinic participation, on-call days, as well as elective operating room days. This should ensure a proportional distribution of both the emergency and elective surgical cases between all the trainees.

The General Surgery registrars are made up of trainees from South Africa as well as a number of International Postgraduate trainees. This is not unique to UCT, as described by Kong et al., international medical graduates contribute to the surgical workforce and assist in meeting the service delivery needs of the institution.³⁰ Of these international trainees described, 92% were male, in contrast to another South African university which reported 62% of affiliated supernumeraries were male.³¹ Although the local data suggest that there has been an increase in

the number of female surgical trainees, the data including the international trainees are not known. The International Postgraduate trainees have the option of sub-specialising in South Africa, however they are not permitted to work in South Africa, and leave the country after their training.

The aim of this study is to describe the differences in operative experience in male and female trainees during their rotation in the ACGSU at GSH. The preliminary investigation and findings can be used to design future studies to explore possible gender bias in the surgical training programme.

References

1. Osler W. Speech given at Harvard Medical association annual dinner. *Boston Med Surg J* 1894: 136-42.
2. Phillips NA, Tannan SC and Kalliainen LK. Understanding and Overcoming Implicit Gender Bias in Plastic Surgery. *Plast Reconstr Surg* 2016. DOI: 10.1097/PRS.0000000000002668.
3. Corinne A. Moss-Racusin, John F. Dovidio, Victoria L. Brescoll, et al. Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences* 2012. DOI: 10.1073/pnas.1211286109.
4. Nebeker CA, Basson MD, Haan PS, et al. Do female surgeons learn or teach differently? *The American Journal of Surgery* 2017. DOI: 10.1016/j.amjsurg.2016.10.010.
5. Shipman, Katty Kay and Claire. *The Confidence Gap*. The Atlantic 2014.
6. Minter RM, Gruppen LD, Napolitano KS, et al. Gender differences in the self-assessment of surgical residents. *Am J Surg* 2005. DOI: 10.1016/j.amjsurg.2004.11.035.
7. Flyckt RL, White EE, Goodman LR, et al. The Use of Laparoscopy Simulation to Explore Gender Differences in Resident Surgical Confidence. *Obstet Gynecol Int* 2017. DOI: 10.1155/2017/1945801.
8. Van Heest AE and Agel J. The uneven distribution of women in orthopaedic surgery resident training programs in the United States. *J Bone Joint Surg Am* 2012. DOI: 10.2106/JBJS.J.01583

9. Pico K, Gioe TJ, VanHeest A, et al. Do Men Outperform Women During Orthopaedic Residency Training? *Clin Orthop Relat Res* 2010. DOI: 10.1007/s11999-010-1318-4
10. Yeo HL, Abelson JS, Mao J, et al. Who Makes It to the End? A Novel Predictive Model for Identifying Surgical Residents at Risk for Attrition. *Ann Surg* 2017. DOI: 10.1097/SLA.0000000000002384
11. . Dresler CM, Padgett DL, MacKinnon SE, et al. Experiences of women in cardiothoracic surgery. A gender comparison. *Arch Surg* 1996
12. Lichtenstein J. The Effect of Gender on Resident Autonomy in the Operating room. *Journal of Surgical Education* 2017. DOI: 10.1016/j.jsurg.2017.10.009
13. Hutchison, K. Four types of gender bias affecting women surgeons and their cumulative impact. *J Med Ethics* 2020 Apr;46(4):236-241
14. Heru A. Pink-collar medicine: Women and the future of medicine. *Gend Issues* 2005. DOI: 10.1007/s12147-005-0008-0
15. Barzansky B and Etzel SI. Educational Programs in US Medical Schools, 2002-2003. *JAMA* 2003. DOI: 10.1001/jama.290.9.1190
16. Breier M and Wildschut A. Changing gender profile of medical schools in South Africa. *S Afr Med J* 2008
17. Waljee J, Chang K, Kim H, et al. Gender Disparities in Academic Practice. *Plastic and Reconstructive Surgery* 2015. DOI: 10.1097/PRS.0000000000001530
18. Wendel TM, Godellas CV and Prinz RA. Are there gender differences in choosing a surgical career? *Surgery* 2003. DOI: 10.1016/S0039
19. Van Heest AE and Agel J. The uneven distribution of women in orthopaedic surgery resident training programs in the United States. *J Bone Joint Surg Am* 2012. DOI: 10.2106/JBJS.J.01583

20. Logghe H. #ILookLikeASurgeon Tweet it. Own it.
21. Coopes A. Operate with respect: how Australia is confronting sexual harassment of trainees *BMJ* 2016; 354 :i4210 doi:10.1136/bmj.i4210
22. Yu T, Jain A, Chakraborty M, et al. Factors influencing intentions of female medical students to pursue a surgical career. *J Am Coll Surg*, 2012 215(6): 878-889
23. Kawase K, Nomura K, Tominaga R, et al. Analysis of gender-based differences among surgeons in Japan: results of a survey conducted by the Japan Surgical Society. *Surg Today*, 2018 Jan: 48(1): 33-43
24. Palepu A, Herbert C. Medical women in academia: the silences we keep. *CMAJ* 2002 Oct 2015; 167(8): 877-879
25. Kawase K, Carpelan-Holmström M, Kwong A, Sanfey H. Factors that can promote or impede the advancement of women as leaders in surgery: results from an international survey. *World J Surg* 2016 Feb:40 (2): 258-266
26. Umoetok F, van Wyk J, Madiba T. Does gender impact on female doctors' experience in the training and practice of surgery? *S Afr J Surg*. 2017 Jun: 55(2):70
27. Roodt, L. 2016. Female general surgeons: current status, perceptions and challenges in South Africa. A pilot study at a single academic complex. University of Cape Town. <http://hdl.handle.net/11427/23661>
28. Hoops H, Heston A, Dewey E, Spight D, Brasel K, Kiraly L. Resident autonomy in the operating room: Does gender Matter? *Am J Surg* 2019 Feb;217(2):301-305
DOI:<https://doi.org/10.1016/j.amjsurg.2018.12.023>
29. Klopper J, Rayamajhi S, Venter J, et al. Provision of acute and elective general surgical care at a tertiary facility in the era of subspecialisation. *S Afr Med J*. 2017 Oct 31;107(11):948-951

30. Kong V, Odendaal J, Sartorius B, Clarke D. International medical graduates in South Africa and the implications of addressing the current surgical workforce shortage. *S Afr J Surg.* 2015 Dec; 53(3 and 4): 11-14.

31. Gxobole A, Naidoo R, Singh B. The supernumerary registrar experience in KwaZulu-Natal. *S Afr J Surg.* 2023 Mar;61(1):104-107. PMID: 37052273.

ABSTRACT

Background: There has been an increase in female medical student admissions since the millennium, worldwide and locally, and this has translated into an increase in the number of females pursuing a career in surgery. The number of postgraduate enrolments has increased, however this has not translated into a proportional increase of females in the surgical discipline. The aim of this study is to determine if there are any differences in surgical training opportunities between the female and male surgical trainees at Groote Schuur Hospital (University of Cape Town – UCT), during their rotation in the Acute Care and General Surgery Unit (ACGSU).

Methods: This is a retrospective review of theatre records from April 2015 to September 2017. All Registrars in the Division of General Surgery who completed duties in the ACGSU during this time period were included in the analysis. The information collected included the primary surgeon and first assistant (male or female, trainee or consultant), type of surgery (emergency / elective), triage code of emergency booking indicating the urgency of the procedure (green / yellow / orange / red), general anesthesia (yes / no), procedure type (major vs minor), duration of procedure and place of postoperative care. The data from the most commonly performed procedures were analysed. Gender differences by variable were analysed using chi-squared test.

Results: Of the 67 postgraduate students registered as trainees in the Division of General Surgery, 32 were South African and 35 International trainees. Female trainees made up 38% of the South African cohort and only 11% of the International cohort. Of the 67 trainees, 46 completed duties in the ACGSU and were included in the analysis. Ten (21.7%) of the 46 trainees were female. Female trainees were reported as the primary surgeon more often, as well as performing more elective and emergency operations than the male trainees. The triage coding of the emergency operations and the median operative duration was associated with gender, favouring females. There was no significant gender difference regarding the place of post-operative care.

Conclusion: For general surgery, there is a disproportionate number of male trainees enrolled in postgraduate training, especially amongst the international cohort. The international trainees contribute to more than half of the total number of trainees. Despite this, the female trainees act as the primary surgeon significantly more often. The reasons are most likely multifactorial and require further investigation

Gender specific operative experience during training in an academic general surgery unit

Authors

Bertels L, Klopper JH, du Toit T

Introduction

The increase in the ratio of female to male medical student admissions has been noted since the beginning of the millennium.^{1,2} This trend is evident both internationally and locally.³

The inevitable increase in the number of female individuals pursuing a career in surgery has highlighted difficulties inherent in this change,⁴ which has not only been examined in scholarly work, but also expressed in social media.⁵⁻⁷ The historical bias against females in all vocations, including medicine, is still well entrenched.^{8,9} Women, moreover, underestimate and devalue their abilities and capabilities in the healthcare setting.¹⁰⁻¹³ This occurs despite research showing no difference in performance, including in male-dominated specialties such as Orthopaedic Surgery.^{6,14} Gender has furthermore been described as a risk factor in the attrition rate of surgical trainees.¹⁵

The role of gender in the operating room during training has been examined to a lesser extent. Reports have been published showing a significant bias against female residents.^{16,17} A study by Hutchison et al., (n=46 female surgeons) found four types of bias affect women surgeons, namely workplace factors, epistemic injustices, stereotypical expectations by colleagues as well as patients, and objectification.¹⁸ How this is expressed in terms of equal opportunity to gain operative experience is not known in the local setting.

During their training, General Surgery registrars rotate through the Acute Care and General Surgery Unit (ACGSU)¹⁹ The allocation to the rotation is not dependent on surgical competency or year of training. The registrars are made up of trainees from South Africa as well as a number of International Postgraduate trainees. Of these international trainees described, the data including the international trainees are not known.

The aim of this study was to enumerate the differences in operative opportunity provided to female and male trainees during this rotation. The findings were expressed in terms of the proportion of female and male trainees, to determine whether gender-bias exists and to assist with the design of future research initiatives.

Methodology

This is a retrospective review of prospectively collected data stored on an online application, of all surgeries conducted between April 2015 and September 2017. General Surgery registrars in the Division of General Surgery at Groote Schuur Hospital (GSH), University of Cape Town (UCT) complete a three or six month rotation through the Acute Care and General Surgery Unit (ACGSU).¹⁹ The total number of registrars (residents / trainees) in the Division of General Surgery was ascertained, and both local and international trainees who completed surgical duties in the ACGSU at during this time period were included in the analysis. The ACGSU duty rosters are designed to allow an equal weekly duty rotation for trainees during their rotation. The roster considers ward work, clinic participation, on-call days, as well as elective operating room days. This should ensure a proportional distribution of both the emergency and elective surgical cases between all the trainees. Trainees are allowed to act as primary surgeon under the supervision and discretion of a consultant (attending) surgeon. All trainees are registered as postgraduate students of UCT and are subject to the same rules and regulations of the South African Health Professions Council. Local and international trainees are set the same requirements by the Colleges of Medicine of South Africa, inclusive of rotations, caseloads, examinations, and research. There is no formal assessment of surgical competence at the start of the rotation.

The information collected included the primary surgeon and first assistant (male or female, trainee or consultant), type of surgery (emergency / elective), triage colour-coded system of emergency booking indicating the urgency of the procedure (green / yellow / orange / red), general anaesthesia (yes / no), procedure type (major vs minor), duration of procedure and place of postoperative care. The data from the most commonly performed procedures were analysed.

Data analysis will be performed using the Jupyter kernel of IPython with the following libraries: numerical python, scientific python, statsmodels, and scikit-learn.²⁰⁻²³ Data will be managed by the pandas library and all plotting will be based on the matplotlib library.^{24, 25} Frequencies with percentage were used to summarise categorical variables. Comparisons of common procedures and emergency procedures between gender were analysed by the chi-squared test. Descriptive statistics for numerical variables were presented as median with interquartile range (IQR) and compared between gender groups using the Wilcoxon rank-sum test. Surgeries per trainee were calculated by total surgeries performed divided by number in gender group. The surgeries where the registrars were primary surgeon, were included in the data set.

Data were captured from operative notes in google sheets on a secured network from operative notes and the UCT Human Ethics Committee provided permission for this research (HREC reference 508/2018).

Results

At the time of completion of data collection, 67 postgraduate students were registered as trainees in the Division of General Surgery (Figure 1). South African citizens made up the minority of this group, with a total count of 32 (48%). Twelve (38%) of the South African cohort were female and 4 (11%) of the 35 international trainees were female. The country of origin of the international students are shown in Table 1. During the study period, 46 of the trainees rotated through ACGSU. The study cohort was comprised of 10 (21.7%) female and 36 (78.3%) male trainees.

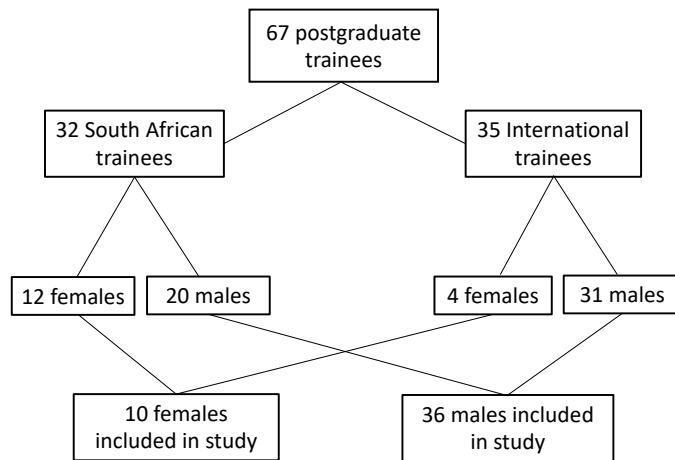


Figure 1. Breakdown of trainee demographics in the Division of General Surgery.

The total number of surgical cases recorded over the study period was 2902 cases. Trainees were recorded as the primary surgeon in 2 415 (83%) surgical procedures versus consultants in 487 cases (17%). Most procedures were emergency surgeries (n=1 903, 66%).

The data from the most common procedures performed was analysed, and this accounted for 1614 cases.

Females were reported as primary surgeon significantly more often than males with surgeries per trainee of 75.7 versus 46.1. Females performed more emergency surgeries per trainee, 52.1 versus 32.4, and elective surgeries per trainee 23.6 versus 13.6.

Of the common procedures, male trainees performed proportionally more omentopexies for perforated peptic ulcer and laparoscopic appendicectomies than the female trainees.

The distribution of male versus females for the more common procedures, as well as the number of cases per trainee, are shown in table 2.

Triage of the emergency procedures were associated with gender i.e. females performed relatively more emergency surgeries, across all triage categories (p -value < 0.01) (table 3).

The median operative duration for females was 45 minutes compared to 50 minutes for males ($p < 0.01$).

Both genders had a similar proportion of patients admitted to a high care unit after surgery.

Discussion

Despite the trainee gender enrolment disparity, female trainees performed a greater number of surgical procedures for most surgical procedures. This differs from a report from the U.S.A, which showed that male trainees experienced more surgical autonomy in the operating room.²⁶ The reasons for the higher rate of female principal surgeons are not clear from these data. The ACGSU duty rosters are designed to allow an equal weekly duty rotation for trainees during their rotation. The roster considers ward work, clinic participation, on-call days, as well as elective operating room days. This should have ensured a proportional distribution of both the emergency and elective surgical cases, which was not borne out.

Despite the aim of the University to discourage gender bias in student numbers, only 38% of the South African trainees were female, with the disparity amongst the international trainees was notably higher. The percentage of female South African surgical trainees is in keeping with reports of the female surgical workforce in the United States.²⁷ Gender, though, has been shown to be strongly associated with attrition, although the local rate is not known.¹⁵ It is therefore impossible to predict whether the current 38% cohort will eventually translate into a similarly-proportioned workforce. In view of the overall low number of surgeons in the country, it can be predicted with some confidence that the number of future female surgeons will remain below expectation.

There is a disproportionate number of international trainees in this dataset. The biggest discrepancy (both in terms of overall and gender counts) arose due to the number of trainees

from Libya, which totalled 15. All of these trainees were male. The United Arab Emirates had the joint second largest number of trainees, totalling four, all of whom were, likewise, male. Irrespective of origin, all foreign trainees leave the country after completion of their studies and do not contribute to the specialist surgical workforce in South Africa. This must be viewed in light of a previous report from this department which described a critical shortage in surgical human resources in South Africa.^{28, 29} The problem is compounded by more trainees deciding on sub-specialisation. With fewer specialist general surgeons entering the market, the ultimate effect on the provision of adequate surgical care requires immediate scrutiny.

Of the common procedures chosen for analysis, omentopexy for perforated peptic ulcer and laparoscopic appendectomies was shown to be performed proportionately more by male trainees. This may suggest a possible discrepancy between elective and emergency procedures. It is known that these procedures occur more frequently after hours, during which time negotiation to perform these procedures must be concluded with the rest of the operative teams, inclusive of nursing and anesthetic staff, which *might* allude to one reason for this discrepancy. This remains speculative since this was not measured in our study. Despite not reaching statistical significance, there was a trend towards the female trainees performing more laparoscopic cholecystectomies. It can therefore be postulated that there is thus no difference in training for males or female trainees performing laparoscopic procedures.

When analysed, males took longer to perform the common surgical procedures, the reason for this is unclear, and the clinical significance is likely to be negligible.

Triage coding of emergency cases was in keeping with the significantly higher proportion of procedures performed by female trainees, and most procedures were female-led. The triage coding system and place of post-operative care cannot be used as indicators of complexity of surgery because they are more reflective of patient related factors.

This study was conducted over a period of more than 2 years and involved multiple rotations of trainees.-During this period there was no formal objective assessment of the trainees at the start of the rotation, noting that technical competence is not easily defined in the literature.^{30, 31} The data set does not account for level of experience, length of time spent in the rotation, and the variable number of cases performed by each trainee, which would contribute to better measures of disparity.

There are multiple limitations of this study, which would need to be explored further. In order to measure gender bias more accurately and adjust for complex confounding, a greater number of variables would need to be measured. These include trainee experience; number, experience and involvement of consultants; gender of consultants; number of rotations through the unit; time spent in the unit; and daytime vs. after hours emergency cases. There should be clear definitions on who is primary surgeon, or assisting surgeon, and what roles each fulfills during the procedure, i.e. is the trainee supervised with the senior surgeon assisting, or is the supervising surgeon called on demand. Other factors which may contribute to the limitations of the study include the initiative of the trainee in booking the cases, the home language of the trainee and the ability to effectively communicate with colleagues, however, these are more difficult to define. The operating time of each surgeon can also be further explored, as it is likely that there are many contributing factors, including skill and experience of the surgeon, equipment failures, and complexity of the surgery. Analysis of all data points can then be done.

This study was not able to adequately address our research question on whether there is gender-based bias in the workplace among ACGSU. A specifically designed study to investigate gender bias would require significantly more data to measure complex understanding of the confounding features of implicit and explicit bias.

Conclusion

In the division of general surgery, at UCT, there is a disproportionate number of male trainees enrolled in postgraduate training, especially amongst the international cohort. The international trainees contribute to more than half of the total number of trainees. Despite this, the female trainees act as the primary surgeon significantly more often. The reasons are most likely multifactorial and require further investigation.

Tables

Table 1 Country of origin of international trainees

COUNTRY	COUNT	MEN	WOMEN
Bahrain	1	1	0
Botswana	4	1	3
Ethiopia	1	1	0
Ghana	1	1	0
Kenya	2	1	1
Libya	15	15	0
Mauritius	2	2	0
Namibia	2	2	0
South Sudan	1	1	0
United Arab Emirates	4	4	0
Zambia	1	1	0
Zimbabwe	1	1	0

Table 2 Common procedures and gender distribution

PROCEDURE	Performed by female surgeon (n=10 females)	Performed by male surgeon (n=36 males)	RESULT	F:M procedures per trainee
Major amputation	123 (39.2%)	191 (60.8%)	χ^2 56.1 p-value < 0.01	12.3 : 5.3
Minor debridement	93 (34.8%)	174(65.2%)	χ^2 26.9 p-value < 0.01	9.3 : 4.8
Laparoscopic cholecystectomy	50 (27.5%)	132 (72.5%)	χ^2 3.5 p-value = 0.06	5.0 : 3.7
Inguino/femoral hernia repair	62 (29.0%)	152 (71%)	χ^2 6.6 p-value = 0.01	6.2 : 4.2
Ventral hernia repair	68 (31.6%)	147 (68.4%)	χ^2 12.4 p-value < 0.01	6.8 : 4.1
Open appendectomy	62 (38.3%)	100 (61.7%)	χ^2 38.8 p-value < 0.01	6.2 : 2.8
Small bowel obstruction	23 (36.5%)	40 (63.5%)	χ^2 8.1 p-value < 0.01	2.3 : 1.1
Laparoscopic appendectomy	19 (15.4%)	104 (84.6%)	χ^2 2.9 p-value = 0.09	1.9 : 2.9
Omentopexy for perforated peptic ulcer	7 (16.7%)	35 (83.3%)	χ^2 0.6 p-value = 0.42	0.7 : 1.0
Colectomy	9 (28.1%)	23 (71.9%)	χ^2 0.8 p-value = 0.38	0.9 : 0.6

Table 3 Emergency triage procedure color coding and gender distribution

COLOUR	WOMEN	MEN	RESULT
Green	28 (37.3%)	47 (62.7%)	χ^2 10.7 p-value < 0.01
Yellow	374 (30%)	874 (70%)	χ^2 49.7 p-value < 0.01
Orange	108 (30%)	247 (70%)	χ^2 15.7 p-value < 0.01
Red	5 (33.3%)	10 (66.7%)	χ^2 17.8 p-value < 0.01

References

1. Heru A. Pink-collar medicine: Women and the future of medicine. *Gen Issues* 2005. DOI: 10.1007/s12147-005-0008-0.
2. Barzansky B and Etzel SI. Educational Programs in US Medical Schools, 2002-2003. *JAMA* 2003. DOI: 10.1001/jama.290.9.1190.
3. Breier M and Wildschut A. Changing gender profile of medical schools in South Africa. *S Afr Med J* 2008.
4. Waljee J, Chang K, Kim H, et al. Gender Disparities in Academic Practice. *Plastic and Reconstructive Surgery* 2015. DOI: 10.1097/PRS.0000000000001530.
5. Wendel TM, Godellas CV and Prinz RA. Are there gender differences in choosing a surgical career? *Surgery* 2003. DOI: 10.1016/S0039.
6. Van Heest AE and Agel J. The uneven distribution of women in orthopaedic surgery resident training programs in the United States. *J Bone Joint Surg Am* 2012. DOI: 10.2106/JBJS.J.01583.
7. Logghe H. #ILookLikeASurgeon Tweet it. Own it.
8. Phillips NA, Tannan SC and Kalliainen LK. Understanding and Overcoming Implicit Gender Bias in Plastic Surgery. *Plast Reconstr Surg* 2016. DOI: 10.1097/PRS.0000000000002668.
9. Moss-Racusin CA, Dovidio JF, Brescoll VL, et al. Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences* 2012. DOI: 10.1073/pnas.1211286109.
10. Nebeker CA, Basson MD, Haan PS, et al. Do female surgeons learn or teach differently? *The American Journal of Surgery* 2017. DOI: 10.1016/j.amjsurg.2016.10.010.

11. Shipman, Katty Kay and Claire. *The Confidence Gap*. The Atlantic 2014.
12. Minter RM, Gruppen LD, Napolitano KS, et al. Gender differences in the self-assessment of surgical residents. *Am J Surg* 2005. DOI: 10.1016/j.amjsurg.2004.11.035.
13. Flyckt RL, White EE, Goodman LR, et al. The Use of Laparoscopy Simulation to Explore Gender Differences in Resident Surgical Confidence. *Obstet Gynecol Int* 2017. DOI: 10.1155/2017/1945801.
14. Pico K, Gioe TJ, VanHeest A, et al. Do Men Outperform Women During Orthopaedic Residency Training? *Clin Orthop Relat Res* 2010. DOI: 10.1007/s11999-010-1318-4.
15. Yeo HL, Abelson JS, Mao J, et al. Who Makes It to the End? A Novel Predictive Model for Identifying Surgical Residents at Risk for Attrition. *Ann Surg* 2017. DOI: 10.1097/SLA.0000000000002384.
16. . Dresler CM, Padgett DL, MacKinnon SE, et al. Experiences of women in cardiothoracic surgery. A gender comparison. *Arch Surg* 1996.
17. Lichtenstein J. The Effect of Gender on Resident Autonomy in the Operating room. *Journal of Surgical Education* 2017. DOI: 10.1016/j.jsurg.2017.10.009.
18. Hutchison, K. Four types of gender bias affecting women surgeons and their cumulative impact. *J Med Ethics* 2020 Apr;46(4):236-241
19. Klopper JH, Rayamajhi S, Venter JJ, et al. Provision of acute and elective general surgical care at a tertiary facility in the era of subspecialisation. *South African medical journal = Suid-Afrikaanse tydskrif vir geneeskunde* 2017. DOI: 10.7196/SAMJ.2017.v107i11.12335.
20. Pedregosa F, Varoquaux G, Gramfort A, et al. Scikit-learn: Machine Learning in Python. *Journal of Machine Learning Research* 2011.

21. Kubilius J. A framework for streamlining research workflow in neuroscience and psychology. *Frontiers in neuroinformatics* 2013.
22. Walt Svd, Colbert SC and Varoquaux G. The NumPy Array: A Structure for Efficient Numerical Computation. *Computing in Science & Engineering* 2011. DOI: 10.1109/MCSE.2011.37.
23. Pérez F and Granger BE. IPython: A System for Interactive Scientific Computing. *Computing in Science & Engineering* 2007. DOI: 10.1109/MCSE.2007.53.
24. McKinney W. Python for data analysis, <http://conference.scipy.org/proceedings/scipy2010/mckinney.html> (2012).
25. Hunter JD. Matplotlib: A 2D Graphics Environment. *Computing in Science & Engineering* 2007. DOI: 10.1109/MCSE.2007.55.
26. Meyerson, S. L., Sternbach, J. M., Zwischenberger, J. B., & Bender, E. M. (2017). The Effect of Gender on Resident Autonomy in the Operating room. *Journal of Surgical Education*, 74(6), e111-e118. <https://doi.org/10.1016/j.jsurg.2017.06.014>
27. Seemann NM, Webster F, Holden HA, et al. Women in academic surgery: why is the playing field still not level? *Am J Surg* 2016. DOI: 10.1016/j.amjsurg.2015.08.036.
28. Dell AJ and Klopper J. Surgical resources in South Africa: an analysis of the inequalities between the public and private sector. *South African journal of surgery. Suid-Afrikaanse tydskrif vir chirurgie* 2018.
29. Dell AJ and Kahn D. Where are general surgeons located in South Africa? *South African journal of surgery. Suid-Afrikaanse tydskrif vir chirurgie* 2018.
30. Swaroop Vedula S, Masaru Ishii, Gregory D. Hager. Objective Assessment of Surgical Technical Skill and Competency in the Operating Room. *Annual Review of Biomedical Engineering* 2017 19:1, 301-325

31. Szasz P, Louridas M, et al. Assessing Technical Competence in Surgical Trainees. *Annals of Surgery* June 2015; 261(6):1046-1055



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15 August 2018

HREC REF: 508/2018

Dr J Klopper
Division of General Surgery
3-Floor
OMB

Dear Dr Klopper

PROJECT TITLE: GENDER BIAS IN TRAINEE OPERATIVE EXPERIENCE IN AN ACADEMIC ACUTE CARE AND GENERAL SURGERY UNIT (MMed Candidate - Dr Laurie Bertels)

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

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 August 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.

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

We acknowledge that the student: Dr Laurie Bertels will also be involved in this study.

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.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

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Journal references: Price NC, Jacobs NN, Roberts DA, et al. Importance of asking about glaucoma. *Stat Med* 1998;289(1):350-355. [<http://dx.doi.org/10.1000/hgjr.182>] [PMID: 2764753]

Book references: Jeffcoate N. *Principles of Gynaecology*. 4th ed. London: Butterworth, 1975:96-101. Chapter/section in a book: Weinstein L, Swartz MN. Pathogenic Properties of Invading

Microorganisms. In: Sodeman WA jun, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974:457-472.

Internet references: World Health Organization. The World Health Report 2002 - Reducing Risks, Promoting Healthy Life. Geneva: World Health Organization, 2002.
<http://www.who.int/whr/2002> (accessed 16 January 2010).

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