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A cross-sectional study of the impact of COVID-19 on surgical registrar training at the University of KwaZulu-Natal.

Dr. Faizal Thayab[1*], Dr. Bashir Laheu[2], Dr. Carl-Heinz Kruse[3]
(MBChB)Discipline of Ophthalmology, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, 719 Umbilo Road, Berea 4001, Durban, South Africa[1]
Honorary lecturer, Department of Ophthalmology, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, 719 Umbilo Road, Berea 4001, Durban, South Africa[2]
Sessional Lecturer, Department of Ophthalmology, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, 719 Umbilo Road, Berea 4001, Durban, South Africa[3]

Abstract

Background
Data are scarce regarding how the COVID-19 pandemic has affected surgical training in low- and middle-income countries. This study investigates the pandemic's influence on postgraduate surgical education and research activities among registrars at the University of KwaZulu-Natal in South Africa.

Methods
A cross-sectional study was conducted using an online survey administered between 6 September 2023 and 28 February 2025. The target population comprised all surgical registrars, including those in anaesthesiology, enrolled at the Faculty of Medicine and Health Sciences, University of KwaZulu-Natal, from March 2020 to December 2022. The survey consisted of twenty-four multiple-choice questions designed to assess the perceived impact of the COVID-19 pandemic on clinical skill development, training activities, examination readiness, and postgraduate research involvement.

Results
A total of 70 registrars participated in the study. Among them, 63 participants (90%) reported a decrease in surgical training. 53 participants (75.7%) reported a perceived decrease in the acquisition of surgical skills, and nine registrars (28.1%) were required to modify or restart their postgraduate research projects, while only two (5.3%) reported that their research activities were unaffected by the pandemic.

Conclusion
During the COVID-19 pandemic, surgical trainees at this institution reported a decrease in the quality of surgical training and skills acquisition.

Recommendation
Further research at multiple centres to provide broader insights and larger sample sizes to allow for meaningful comparisons across different surgical specialties regarding the impact of COVID-19 on registrar training programs.

***Keywords**: COVID-19, Education, Medical, Graduate, Specialties, Surgical*
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***Corresponding author:** Dr. Faizal Thayab[*]*
***Email:** faizaltha@yahoo.com Orchid ID: https://orchid.org/0009-0000-8266-1029*
(MBChB)Discipline of Ophthalmology, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, 719 Umbilo Road, Berea 4001, Durban, South Africa

Introduction

On March 11, 2020, the World Health Organization (WHO) officially declared COVID-19 a global pandemic. At that point, South Africa accounted for over half of the confirmed COVID-19 cases reported across Africa (1).

This alarming situation prompted urgent and substantial changes within the public healthcare sector to manage the unfolding health emergency. In response, healthcare workers were reallocated to high-priority areas to help

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manage the increasing number of COVID-19 patients (2, 3).

To accommodate this shift, non-urgent services—such as elective surgical procedures and outpatient consultations—were significantly scaled back. Reports indicate that elective surgeries declined by as much as 71% (4). Simultaneously, academic training programs were either suspended or adapted for virtual delivery using online platforms (5). This disruption is believed to have had a considerable negative impact on surgical trainees, particularly in their ability to develop and refine essential clinical skills.

While extensive research from high-income countries (HICs) has examined how surgical training has been adapted—highlighting greater reliance on digital education, independent study, and research activities—there remains limited information from low- and middle-income countries (LMICs), where surgical workforce shortages are more severe. This study aims to investigate how the COVID-19 pandemic influenced the educational and research experiences of surgical and anaesthetic registrars at the University of KwaZulu-Natal in South Africa.

Methodology

Study design

Prospective cross-sectional observational design. This design was ideal for conducting this survey-based descriptive study, as it was an efficient and cost-effective way to gather data, as well as to understand the associations between variables.

Study setting

Public sector healthcare facilities where surgical and anaesthesiology doctors are employed as registrars and registered with the Nelson R Mandela School of Medicine at the University of KwaZulu-Natal (UKZN) located in Durban, South Africa. This university was established in 2004 through the amalgamation of the University of Durban-Westville and the University of Natal. UKZN has since become a leading research-intensive university in the country. The institution operates across several campuses within the KwaZulu-Natal province and is widely respected for its dedication to scholarly excellence, innovation, and meaningful community involvement. Recognized as one of the largest universities in sub-Saharan Africa, UKZN has earned global acclaim for its research, especially in medicine, engineering, and the physical sciences. Data for this study were collected through an online survey conducted between 06 September 2023 and 28 February 2025.

Participants

Participants were recruited through non-randomized quota sampling, with invitations extended via email and WhatsApp by divisional heads and registrar representatives. Inclusion criteria included registrars in a surgical discipline, including anaesthesiology, registered with the University of KwaZulu-Natal between March 2020 to February 2025. Exclusion criteria - Registrars not registered with UKZN during the pandemic, non-surgical registrars, and incomplete questionnaires.

Bias

An online survey was developed using SurveyMonkey.com, included 24 non-leading multiple-choice questions targeting the impact of COVID-19 on clinical training, exam preparation, and postgraduate research. Before distribution, the survey tool was piloted by the authors to identify any confusing or biased items. Inclusion and exclusion criteria were clearly defined. No identifying information or demographic data were collected to maintain anonymity and improve the reliability of responses. Reminders were sent via email and Whatsapp to registrars to improve response rates.

Study size

A sample size of 70 respondents was obtained in this study. To determine the sample size, we assumed a proportion (50%), with 95% confidence (=1.96), d = desired level of absolute precision (=10%), and a 4 % increase was made to allow for attrition. It is assumed that this sample size will reduce the type I and type II errors, as well as the known and unknown confounders' effects. Thus, power (1-β) (the % chance of detecting a difference) of the study was set at 80%. Based on these statistical parameters, we obtain a sample size of 71 surgical and anaesthetic registrars. Furthermore, to make allowance for attrition, a 4% increase was made, and this resulted in a sample size of 78 registrars. This step is necessary to ensure the study can achieve a reliable statistical significance. 73 responses were received, with three having to be excluded as they did not meet the inclusion criteria. In a previous South African study, 35 out of a total of 98 registrars (36%) completed the survey(6).

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Data collection

An online survey was developed using SurveyMonkey.com®.com®, included 24 non-leading multiple-choice questions targeting the impact of COVID-19 on clinical training, exam preparation, and postgraduate research. The study's aims and procedures were explained at the beginning of the questionnaire, and informed consent was implied through survey completion. Upon completion, the electronic data was stored on a password-protected digital device, with access only permissible to the investigator, supervisor, and statistician.

Variables

This study examined the effect of the COVID-19 pandemic (exposure) on postgraduate training outcomes among surgical and anaesthetic registrars. Outcomes of interest included changes in operative exposure, disruption of academic activities, and self-reported training adequacy. Predictor variables included registrar level, specialty, hospital placement, and access to online educational resources. Potential confounders such as seniority, institutional response to the pandemic, and individual health status were considered in the analysis.

Statistical analysis

Likert scale items, which were originally 5-point scales, were recoded into three-point scales by combining "strongly agree" and "agree", and combining "disagree" and "strongly disagree". Frequency tables and percentages of responses were used to summarise the data, whilst associations between items and responses were assessed using cross-tabulations and Fisher's exact 2-sided p-values (from Fisher-Freeman-Halton exact tests in the case of r by c contingency tables). This study was not specifically powered to detect associations between variables; thus, the absolute differences in proportions were interpreted for trends in addition to p-values when statistical testing was done. An alpha of 0.05 was used.

Ethical considerations

Ethics approval was granted by the University of KwaZulu-Natal's Biomedical Research Ethics Committee (BREC), a subdivision of the Health Research Ethics Committee (Ref BREC/00005576/2023). The study was explained in the preface of the online questionnaire, and informed consent was considered implied when the participant completed it.

Results

73 responses were received, of which three were excluded for not meeting inclusion criteria, for the reason of being from non-surgical disciplines (neurology, psychiatry and pediatrics, and child health). Seventy responses were included in the final analysis. Table 1 presents the distribution of participants across various surgical and anaesthetic disciplines. Anaesthesiology registrars comprised the largest proportion (27.1%), followed by general surgery and ophthalmology (18.6% each).

Table 1: Discipline of participants

Discipline	Count (n=70)	%
Anaesthesiology	19	27.1%
cardiothoracic surgery	1	1.4%
ENT surgery	2	2.9%
General Surgery	13	18.6%
Neurosurgery	3	4.3%
Obstetrics and Gynaecology	7	10.0%
Ophthalmology	13	18.6%
Orthopaedic Surgery	3	4.3%
Paediatric Surgery	6	8.6%
Plastic Surgery	2	2.9%
Urology	1	1.4%
Total	70	100.0%

Most respondents (76%) were junior registrars in their first year of training. Among these, 81% of juniors and all (100%) of senior registrars (years three to five) indicated their training was impacted by the pandemic. There was a non-statistically significant association between year of registrar training and the impact of the COVID-19 pandemic (p=0.242) on training.

39/70 participants (55.7%) were redeployed to non-surgical roles. Of these, two-thirds reported that

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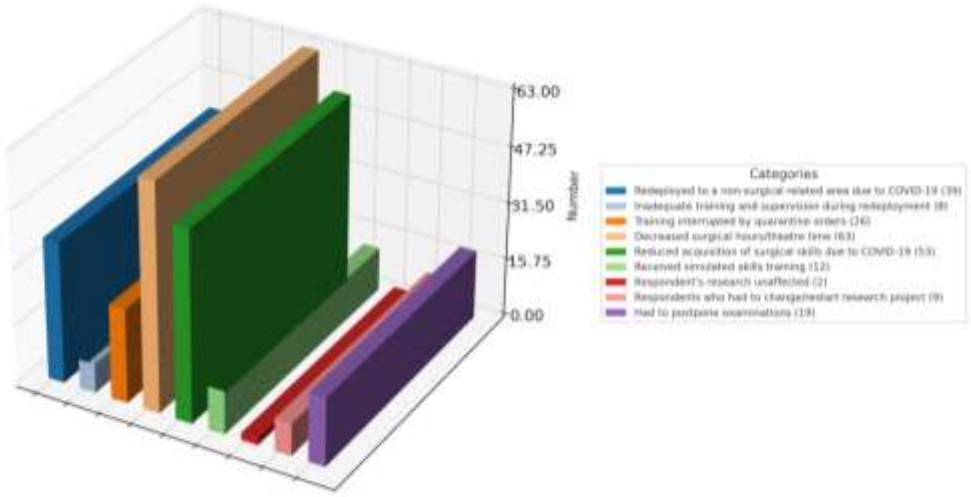
redeployment negatively affected their training, and only 28.1% believed they received adequate supervision in their new roles.

Table 2: Perceived impact of COVID-19 on surgical training of registrars at the University of KwaZulu-Natal, South Africa

Skills Acquisition	**Number (70)**	**Percentage of total**
Redeployed to a non-surgical related area due to COVID-19	39	55.7%
Inadequate training and supervision during redeployment	8	36.4%
Training interrupted by quarantine orders	26	66.7%
Decreased surgical hours/theatre time	63	90%
Reduced acquisition of surgical skills due to COVID-19	53	75.7%
Received simulated skills training	12	17.1%
Post Graduate Research		
Respondent's research unaffected	2	5.3%
Respondents who had to change/restart a research project	9	28.1%
Examinations		
Had to postpone examinations	19	27.1%

Chart 1: Perceived impact of COVID-19 on registrar training at the University of KwaZulu-Natal, South Africa (n=70)



Sixty-three participants (90%) reported a decline in elective surgical time, while 53 (75.7%) noted a detrimental impact on the development of surgical skills. Nearly all respondents (98.6%) used online platforms for educational purposes. While 54 participants (78.3%) expressed comfort with online teaching, 32 participants (46.4%) believed digital instruction should be more widely adopted. Only 12 participants (17.1%) in this study had access to simulation training. The responses showed that 50% of pediatric surgery registrars had simulation access, which is the highest of all the disciplines, followed by Orthopaedic surgery (33.3%), Obstetrics and Gynecology (28.6%), and then Anaesthesiology (26.3%).

Nineteen participants (27.1%) who were due to undertake examinations reported postponement, and 76% (n=53) of participants were comfortable with the digital format of college examinations. Regarding postgraduate research, 32 (45.7%) registrars experienced research-related disruptions. Of these, 28.1% had to modify or restart their

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projects. Despite these challenges, 47 participants (67%) felt confident in achieving their academic goals, and 63% opposed extending registrar training due to pandemic-related delays.

Discussion

While the immediate public health effects of the COVID-19 pandemic have been extensively documented, its broader and more nuanced consequences are still being explored. Findings from this study underscore how the reorganization of public healthcare services in South Africa during the pandemic significantly affected the experiences of surgical trainees (3). This study found that 55.7% were reassigned, which aligns with, yet is slightly lower than, the 65.7% redeployment rate at Stellenbosch University (6). This contrasts with the global redeployment range of 6% to 35.1% identified in a meta-analysis of 29 international surveys (7).

Public health measures, including lockdowns and social distancing, have resulted in the postponement or cancellation of outpatient appointments and elective surgeries. This deliberate reduction in non-urgent healthcare services serves several key objectives: reducing the risk of SARS-CoV-2 transmission within healthcare settings, conserving personal protective equipment (PPE) for frontline COVID-19 care, and reallocating hospital and ICU resources to prepare for potential surges in patient numbers. (8, 9). Ninety percent of respondents in this study reported a reduction in elective surgeries, which aligns with findings from the previously mentioned systematic review, where a decrease of 50% to 99.5% in elective procedures was noted. Additionally, 67% of participants in that review reported a perceived decline in the acquisition of surgical skills, a figure slightly lower than the 75.7% observed in this study (7).

Delivering simulations or practical technical skills training in a virtual format poses considerable challenges (10). Virtual training in low- and middle-income countries faced notable limitations, with academic seminars and journal club meetings emerging as the most commonly reported virtual educational activities (8). According to Archibald et al., Zoom® was generally favoured over other videoconferencing platforms due to its advanced features and user-friendly interface (11). Notably, in a previous study, the majority of respondents (57.5%) indicated a preference for online training sessions over in-person meetings and expressed interest in maintaining virtual formats for educational programs beyond the pandemic (8). In this study, 32 participants (46.4%) felt that more training should be done through online platforms. A systematic review of surgical and anaesthetic training approaches in high-income countries (HICs) revealed a predominant use of simulation-based training, online learning modules, and virtual reality platforms. In contrast, training in low- and middle-income countries (LMICs) continues to rely primarily on traditional apprenticeship models (12). In this study, only 12 respondents (17.1%) across four surgical specialties reported having access to simulation-based training to help compensate for the decline in operative exposure.

In contrast to a separate South African study, it was reported that 77% of participants had completed and submitted their dissertations to the postgraduate surgical colleges—a prerequisite for fellowship completion eligibility—with only one participant needing to restart their research project (6). In this study, only two respondents (2.9%) were able to continue their research without disruption, while nine participants (28.1%) reported having to modify or restart their research projects.

The suspension of clinical activities is likely to impede the professional growth of surgical residents, with a substantial majority (82.1% of participants) recognizing its potential negative effect on their career advancement (8). Despite the postponement of college examinations, 67% of participants in this study expressed confidence in meeting the requirements and completing their exams within the designated training period. This contrasts with findings from another study, where 69% of participants anticipated delays in completing their training programs (13).

Conclusion

The COVID-19 pandemic has profoundly affected healthcare systems globally, disrupting not only service delivery but also the training pathways of registrars at this South African institution. These findings highlight concerning implications for surgical education, given that the acquisition of practical skills is intrinsically dependent on consistent patient caseload and operative exposure. The long-term effects of the reduced number of surgical procedures and the redeployment of trainees to non-surgical specialties remain unclear. Elective surgical services have been significantly reduced, with an impact on skills acquisition during the pandemic (4, 6). Introducing targeted educational approaches, such as simulation-based skills training, could help maintain surgical competencies during challenging times. This would not only protect the future of the surgical workforce, which is already understaffed in many low- and middle-income countries (LMICs), including South Africa, but also reduce reliance on in-person training and mitigate the impact of potential future pandemics. Given

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that this study was conducted at a single academic institution in South Africa, the findings may not be directly generalizable to other training programs or geographical settings. Institutional policies, resource availability, and local pandemic responses may vary significantly across regions. However, the results provide important insights into the challenges faced by postgraduate surgical and anaesthetic trainees in a low- to middle-income country context and may be relevant to similar settings globally.

Study limitations

This study has several limitations. Firstly, it was conducted at a single centre with a relatively low response rate, which restricts the generalizability of the findings. Nevertheless, the sample size surpasses that of several studies included in prior systematic reviews. Future multicentre investigations may provide broader insights. Secondly, the sample size did not allow for meaningful comparisons across different surgical specialties. Thirdly, the reliance on self-reported data introduces the possibility of response bias. Future studies could enhance validity by incorporating objective measures such as data from individual surgical logbooks or structured biannual assessments to more accurately quantify the impact on training. Despite these limitations, the study highlights the diverse and substantial effects of the COVID-19 pandemic on surgical education in a low- to middle-income African setting.

Recommendations

Further research at multiple centres to provide broader insights and larger sample sizes to allow for meaningful comparisons across different surgical specialties regarding the impact of COVID-19 on registrar training programs.

Data availability statement

The data supporting the findings of this study are not publicly available due to restrictions related to participant confidentiality. Anonymised data may be made available from the corresponding author upon reasonable request and with approval from the Institutional Review Board of the University of KwaZulu-Natal.

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Conflict of interest

The authors declare no conflict of interest.

Grant information

The author(s) declared that no grants were involved in supporting this work.

Author contributions

Dr Faizal Thayab – Lead investigator
Dr Bashir Laheu – Co-supervisor
Dr Carl-Heinz Kruse – Co-supervisor

Author biographies

Dr. Faizal Thayab (MBChB), Discipline of Ophthalmology, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, 719 Umbilo Road, Berea 4001, Durban, South Africa.
Dr Faizal Thayab completed his medical degree summa cum laude from the University of KwaZulu-Natal, South Africa in 2015. He has always had a passion for eye care having also completed his Bachelor of Optometry degree cum laude before completing his medical degree. He is currently a fifth-year registrar in Ophthalmology at the University of KwaZulu-Natal and hopes to improve registrar training programs through his future research. This research manuscript is a compulsory component of Faizal Thayab's registrar training.
Orchid ID: https://orchid.org/0009-0000-8266-1029

Dr. Bashir Laheu (MBChB, Dip Ophth, FC Ophth, MMED Ophth) Discipline of Ophthalmology, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, 719 Umbilo Road, Berea 4001, Durban, South Africa.
Dr Laheu is a Consultant in Ophthalmology with an interest in Vitreoretinal sub-speciality and an honorary lecturer at the University of KwaZulu-Natal. His research focus is on acquired macular pathology.

Carl-Heinz Kruse (MBChB, FCOphth, MMed(Ophth)), Discipline of Ophthalmology, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, 719 Umbilo Road, Berea 4001, Durban, South Africa.
Dr Kruse is a sessional lecturer at the University of KwaZulu-Natal. He has an interest in anterior segment surgery, and his research focus is on electronic health records and human error theory.

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