A QUALITATIVE STUDY ON THE TEACHING AND TRAINING PRACTICES OF CONSULTANT ANAESTHETISTS AS EXPERIENCED BY REGISTRARS AT WITS

Madeleine Mattushek

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Declaration

I, Madeleine Mattushek, herewith declare that this research report is my own work. It is being submitted for the degree of Master of Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

Signed on this 20th day of January 2025

Abstract

Background

A qualitative study was done in the Department of Anaesthesia at the University of the Witwatersrand (Wits), South Africa. Interviews were conducted amongst registrars exploring their experience of consultant teaching within the department.

Objective

The study aim was to describe registrar's experience of consultant teaching in the Wits Department of Anaesthesia.

Method

Registrars in the Wits Department of Anaesthesia were invited to participate in individual or small-group semi-structured interviews between November 2022 and February 2023. Twenty-one registrars were interviewed. The interviews were audio recorded, transcribed and analysed. The data were coded using MAXQDA software and themes were identified.

Results

A 143 codes were grouped together to form 11 themes. In the results, registrars expressed what they expected from consultant teachers, how they experience the teaching program, and the consultants that teach them. There was a different focus in teaching experience based on seniority. Registrars highlighted what made teachers excellent or below average. They also made suggestions on how to improve their teaching experience.

Conclusion

Many factors influence how registrars experience consultant teaching including registrar seniority, preferred teaching style and setting of teaching. There was a variable opinion on the importance of consultants as teachers. Registrars highlighted various ways which could impact their training experience positively, such as making use of all learning opportunities and optimising time in theatre allocated to teaching. These changes could contribute to the teaching excellence the Wits Department of Anaesthesia strives for.

Keywords

In-theatre teaching, registrars, consultant, learning, education in anaesthesia

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List of abbreviations

CEO – Chief Executive Officer

CHBAH – Chris Hani Baragwanath Academic Hospital

CMJAH – Charlotte Maxeke Johannesburg Academic Hospital

HJH – Helen Joseph Hospital

P1, Y1 – Participant 1, Year of study 1

paeds – paediatrics

reg – registrar

RMMCH – Rahima Moosa Mother and Child Hospital

tut – tutorial

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DRAFT ARTICLE: A QUALITATIVE STUDY ON THE TEACHING AND TRAINING PRACTICES OF CONSULTANT ANAESTHETISTS AS EXPERIENCED BY REGISTRARS AT WITS

Authors

Dr Madeleine Mattushek[1]

Dr Mithasha Gayaparsad[2]

Dr Sameerah Mohamed[3]

1 - ORCID ID: 0009-0008-1537-882X, MBBCH (WITS), DA (SA). Department of Anaesthesiology, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand. Anaesthesiology Registrar. Corresponding author. Email: madeleine.malan@gmail.com. Contact number: 0823467434. Adress: Charlotte Maxeke Johannesburg Academic Hospital, Department of Anaesthesiology, 7 York Road, Parktown, 2139.

2 - ORCID ID: 0000-0001-7582-7502, MBCHB (UCT), DA (SA), FCA (SA) M Med (Anaes) (Wits). Department of Anaesthesiology, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand. Consultant Anaesthesiologist.

3 - MBCHB (UKZN), DA (SA), FCA (SA), M Med (Anaes) (Wits). Department of Anaesthesiology, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand. Consultant Anaesthesiologist.

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Introduction

The training of anaesthetic registrars relies heavily on guidance from experienced clinical teachers, namely anaesthesia consultants. They stand as role models while supervising clinical skills development and ensuring that anaesthesia theory is evidence-based and practised safely (1, 2). Registrars are trained by consultants, both in and out of theatre to support the development of well-rounded specialists (3).

Teaching is a core competency outlined in the CanMEDS Physician Competency Framework (4). Consultants are expected to teach registrars with confidence. Registrars and consultants may see characteristics describing good clinical teachers differently (5). The literature identified good clinical teachers as being committed, flexible, having good communication skills, being patient, giving feedback, being supportive and involving registrars in teaching (1, 5-8). The University of the Witwatersrand (Wits) Anaesthetic registrars are not taught how to teach. This is common in medical education (2, 9). Clinical teaching is challenging because consultants have to assume many different roles (2). Consultants may be frustrated if they are expected to teach with inadequate preparation and orientation (2).

Practice elements for non-clinical teaching conducted outside theatre include teaching key concepts, audiovisual aids, organised presentations and monitoring registrar understanding and interest of the subject matter (6, 9). To support these practice elements the Wits Department of Anaesthesia hosts didactic tutorials, simulation training and morbidity and mortality meetings.

Teaching in theatre offers registrars the experience of managing clinical cases under direct consultant supervision, allowing the accumulation of tacit knowledge. Tacit knowledge is lessons learned through clinical experience (10) which enhances the development of clinical memory (3). Within the theatre environment, consultant anaesthetists use non-technical skills such as leadership, communication and situational awareness to integrate information and effectively manage clinical cases (11). Training should be taught in ways that are beneficial to registrars (7, 10, 12) and include the development of similar skills and habits, so that they too can ultimately manage cases without supervision.

Theatre is a challenging setting in which to learn as it is space for clinical service delivery and patient care. The busy and noisy theatre environment may present distractions which become an obstacle to effective teaching. Strategies should be employed to foster a conducive learning environment (13).

The Wits Department of Anaesthesia incorporates simulation training which allows registrars to practice patient management and non-technical skills in a simulated theatre environment. Debriefing allows registrars to understand how behaviour and clinical decision-making are influenced by context and highlights areas for growth.

Teaching quality impacts a registrar's performance (3). A study conducted in resource-limited countries, showed that anaesthetic teaching is done by overworked consultants (14). Monitoring and evaluation are often lacking and requires assessment to ensure educational adequacy (6, 14, 15). This may affect teaching quality, which in turn impacts the registrars' performance (3). Teaching is improved by assessment and feedback of medical teachers (1, 3, 6, 13).

There is little research on consultant influence on the registrar's training experience in South Africa. This study was undertaken to describe the registrars' experience of consultant teaching in the Wits Department of Anaesthesia, aiming to identify areas where teaching excellence within the department could be achieved.

Materials & Methods

This descriptive, exploratory qualitative study followed the Declaration of Helsinki and South African good clinical practice guidelines (16, 17). A phenomenological approach was used to gain an understanding of the feelings of registrars regarding their experience of teaching by consultants in the Department of Anaesthesia at Wits (18).

Ethical approval was obtained by the Wits Human Research Ethics Committee (Medical) (M220859). Permission from academic and clinical Heads of Anaesthesia Departments as well as Chief Executive Officers at the following hospitals were obtained: Charlotte Maxeke Johannesburg Academic hospital, Chris Hani Baragwanath Academic hospital, Helen Joseph Hospital and Rahima Moosa Mother and Child Hospital.

Mixed sampling methods were used (19). Initial convenience sampling was practically enabling. Invitations were sent electronically to Wits anaesthesia registrars. Respondents fulfilling inclusion criteria were offered interviews. Registrars who have completed at least 6 months of their registrar time were included.

Purposive sampling (19) followed where registrars from specific demographic groups were invited for interviews to ensure maximum variation and enhanced diversity. All invitees responded favourably.

The primary investigator, a registrar in the department, hosted semi-structured interviews with participants after obtaining written consent. Interviews were hosted in a setting with audiovisual privacy. Demographic information was collected from participants on data collection sheets, which allowed exploration of potential connections between background of participants and the way they perceive training.

Interviews were guided by predetermined, open-ended questions. The researchers developed the question guide around the specific teaching structure used at the Wits Department of Anaesthesia. The primary researcher was at liberty to ask additional questions but this was never required (20). When registrars gave short responses, they were

prompted to elaborate to ensure depth and insight into their experiences. Interview guide design focused on teaching aspects at Wits, including questions listed below.

Box 1: Interview question guide

- How important are consultants in your anaesthesia training and why?
- How do you experience the consultant teaching in the department overall?
- How do you experience the in-theatre teaching by consultants?
- How do you experience the formal tutorials?
- How do you experience the Wednesday afternoon protected teaching?
- In your opinion, which consultant teaching methods do you learn best from?
- Which (if any) teaching methods do you feel do not contribute to your learning?
- Are there any standout teaching moments during your registrar time that you would like to highlight (positive or negative)?
- Can you identify any traits in consultants that have a positive or negative influence on how you experience teaching?
- When you think of consultants who are excellent teachers, what do they do differently to consultants that are average teachers?
- Do or don't you feel that the teaching you receive from consultants will adequately prepare you for upcoming exams?
- Do or don't you feel that the teaching you receive from consultants enable you develop to become a consultant yourself?
- Do or don't you have suggestions or recommendations of how your teaching experience could be improved?
- Do or don't you feel the need that you should be trained on how to teach?

All participants consented to audio recordings during interviews, which were later transcribed with the application "Otter AI" and reviewed and depersonalised by the primary researcher.

Data analysis started concurrently with data collection to determine data saturation (20, 21). Data saturation was determined as no new identifying themes emerged from two subsequent interviews and adequate department demographic representation (22).

Tables 1on demographic representation of participants

Year of birth	1970-1974	1975-1979	1980-1984	1985-1989	1990-1994	
Participants	1	0	2	7	11	
Race	Black	Indian	Coloured	Asian	White	
Participants	6	5	0	2	8	
Gender	Male	Female				
Participant	11	10				
Relationship status	Single	Relationship	Married			

Participants	5	1	15			
Do you have children	Yes	No				
Participants	11	10				
Study year	1st	2nd	3rd	4th	Extended	
Participant	3	8	7	2	1	
Base Hospital	CHBAH	CMJAH	HJH/RMMCH			
Participant	9	7	5			
Current rotation	CHBAH	CMJAH	HJH/RMMCH	ICU	Outreach	Special (CT/NV)
Participant	6	2	5	3	1	4

Between November 2022 and February 2023, 20 interviews were conducted with 21 participants out of 110 registrars within the department. Most interviews spanned a duration of 30 minutes or longer. After 17 interviews, all analysed themes were saturated and no data from subsequent interviews yielded new themes. Participants were offered individual or group-based interviews. The dynamic was similar during group and individual interviews.

Supervisors reviewed de-personalised data before concluding interviews to allow for agreement on data saturation (21). Content analysis commenced and codes were created by the primary researcher. Codes are phrases summarising recurring ideas mentioned during interviews. Codes were assigned to interviews by the primary researcher using "MAXQDA ® software version 20" (20). Throughout coding, the assumptions and biases of the researcher were reviewed to strengthen conformability and objectivity. Reflexive practice was ensured by identification and documentation of assumptions and biases throughout coding. The researcher examined and recognised potential of introducing bias when interpreting data and ensured that the final interpretation reflected participants experiences.

Methods used to enhance credibility were based on Lincoln and Guba's criteria of trustworthiness as described in Table 1 (23).

Table 2: Criteria of trustworthiness

Aspect of trustworthiness	Method applied
Credibility	Prolonged engagement – primary researcher spent prolonged time to ensure adequate understanding and representation of data Persistent observation – primary researcher focused on different aspects of consultant teaching Peer examination – both supervisors reviewed the data and data analysis process Time triangulation – collecting data over two academic rotations

	Person triangulation – collecting data from participants of different seniority
Dependability	Inquiry audit – depersonalised data and coding reviewed by both supervisors Detailed description of methodology Peer review
Conformability	Audit trial – systematic collection and processing of data Triangulation – multiple participants conclude to same codes
Transferability	Inclusion of verbatim quotes from study participants Thick description – thorough description of research content
Reflexivity	Purposeful reflection – use of reflexive journal and field notes in MAXQDA throughout data analysis

Supervisors collaborated during coding allowing confirmation of correct application of codes. Data was re-examined multiple times to enhance this process. Supervisors reviewed randomly chosen interviews with their codes. There was complete agreement by all members of the research team on code application.

Eleven themes were identified under which all codes were grouped.

Results

Twenty-one registrars were interviewed (10 female, 11 male) with equal department demographic representation. Eleven junior registrars in year one (Y1) or year two (Y2) of study and 10 senior registrars in year three (Y3) and year four (Y4) participated. Data sets were coded with 143 different codes. The 11 themes, along with the number of codes they comprise, are shown in Figure 1.

Figure 1: The number of codes that form each theme, the circles are proportionate to the number of codes in each theme

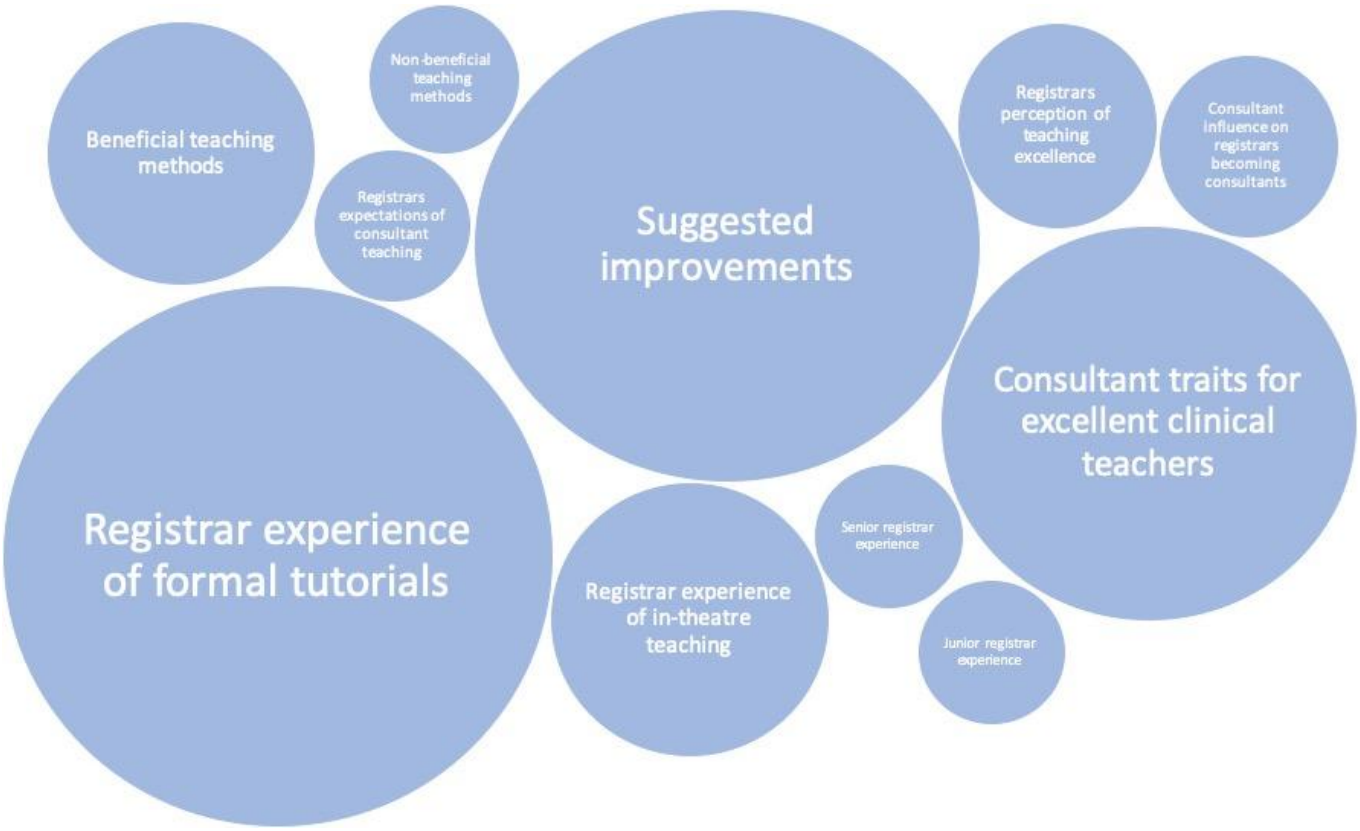
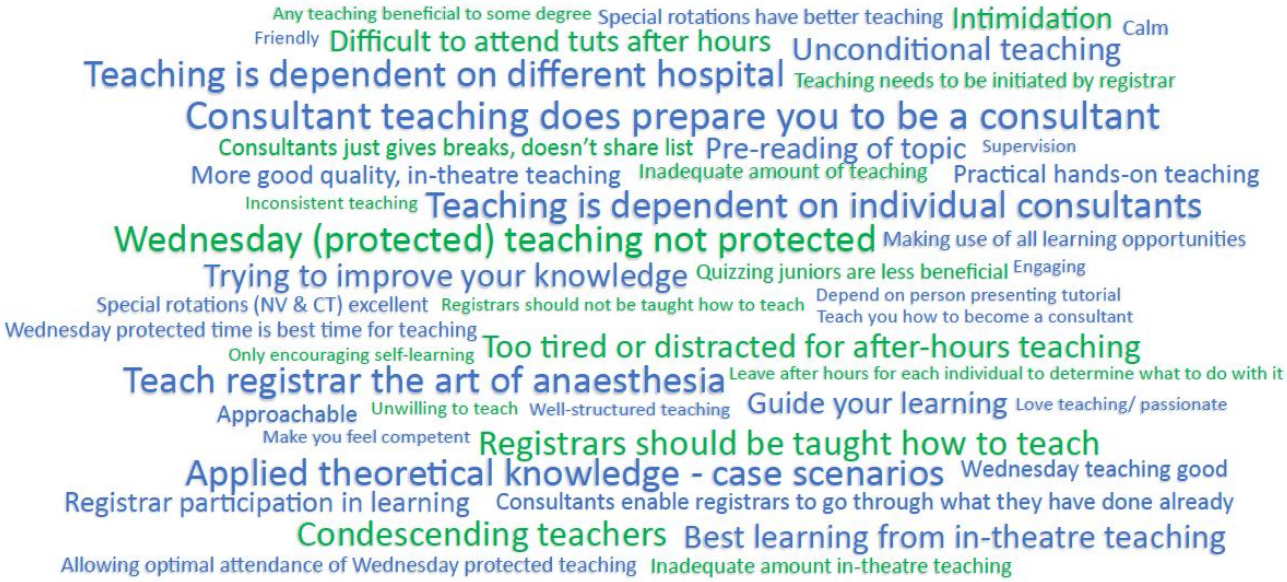


Figure 2: Codes most frequently mentioned during interviews



The following paragraphs explore each identified theme.

Registrar expectations of consultant teaching

Registrars expressed need for consultants to teach them the subtleties of anaesthesia: *"… As you progress your journey as a [registrar] to become a consultant, it becomes more of an art. It's small nuances that aren't mentioned in a textbook, and only by being with someone that*

is more experienced that you learn to hone your skills and do anaesthetics in a very graceful way" (P15, Y1). Participants' comments spoke to the importance of consultant guidance and supervision.

Registrars expect practical in-theatre teaching and for consultants to answer questions. Some registrars expect consultants to teach them how to become specialists: *"Most of our ability as specialists will come from shared experience from our consultants. The experience that they give us and little tips and tricks, and do's and don'ts, come from time in the game and experience and we can't get that by ourselves"* (P4, Y3).

Registrar experience of in-theatre teaching

The majority of registrars acknowledged that daily in-theatre teaching they receive varied based on individual consultants and different hospitals. Participants acknowledged that some consultants assigned to their list were not actively participating in teaching and patient care: *"There's obviously others (consultants) that might as well not be there, they just come to give you a break"* (P20, Y4). Registrars noted that there was inadequate in-theatre teaching: *"In-theatre teaching is poor. Most of the time, they (consultants) don't really teach a lot"* (P17, Y4).

Some registrars felt that teaching in theatre was good. The majority of registrars acknowledged better teaching during specialised rotations.

Registrar experience of formal tutorials

Registrars acknowledged that protected teaching slots were the most practical teaching time: *"The Wednesday tutorial (protected teaching time) is the most ideal time to have tuts"* (P9, Y2). However, also expressed that they were often not relieved from theatre duties in order to attend teaching: *"I don't think they are really protecting our teaching"* (P7, Y1). Registrars expressed satisfaction with teaching when they were able to attend: *"The ones (Wednesday protected tutorials) I have attended are quite good"* (P16, Y2). Some registrars felt that protected teaching time was misused: *"(Wasting protected time) often occurs, because the program that gets organized during protected teaching time is often stuff which very often tend to be not very relevant to us"* (P2, Y4).

Registrars stated that formal tutorial (after-hours) teaching was of good quality and topic variability but that there were too many tutorials which took up personal time that might rather be used for individual learning: *"I feel like I get a bit more done if I just sit and read on my own and I find them too many and it gets a bit overwhelming"* (P5, Y3). Many registrars expressed being distracted or fatigued when having to attend after-hours tutorials.

Junior registrar teaching experience

Senior and junior registrars noted little academic input during junior registrar training: *"In first and second year, in general, there's very little teaching"* (P4, Y3).

Senior registrar teaching experience

Senior registrars almost unanimously stated that teaching during specialised rotations was excellent: *"Now that I've started neuro-vascular (neurosurgery and vascular anaesthesia rotation) and there's a set roster for teaching, it has been so amazing"* (P5, Y3). Senior registrars felt teaching was good for final examination preparation and in guiding them to be primary decision makers.

Consultant influence on registrar training

Many participants feel that consultant teaching is adequate to prepare them to become consultants: *"Watching how different consultants do things and having them with you on your list and actively involved in your list is also really helpful and very useful for educational hands-on learning"* (P5, Y3). However, few registrars expressed a lack of consultant influence on their development: "*I think it's more self-teaching*" (P7, Y1).

Registrars acknowledged benefit when consultants allow them to make clinical decisions. Registrars noted that actively searching for teaching opportunities and engaging with consultants influenced their teaching positively: *"A lot of it has also been self-driven. And I think that if you're a registrar that's not very self-driven, and you don't take a lot of initiative, you might fall very short. Because I think it does require you to actively go out and seek out learning opportunities"* (P3, Y3).

The role of examiner consultants as teachers were noted to be invaluable: *"A lot of them are examiners in the FCA exams, so I feel like interactions with them is very helpful to prepare for the exam*" (P13, Y1).

Beneficial teaching methods

When asked about beneficial teaching methods, registrars noted that clinically applied theory were particularly helpful: *"The best style of teaching, is the teaching that is a theoretical topic that is based around a clinical scenario"* (P2, Y4). The majority of registrars felt that teaching in theatre was the most beneficial teaching method and that it was invaluable to decide on a topic for discussion in advance: *"I personally prefer that we get taught around whatever's happening in theatre"* (P21, Y2).

Registrars commented that active participation and "hands-on" practical teaching was beneficial: *"(It is beneficial) gaining whatever knowledge and especially practical experience that I'm meant to"* (P14, Y2).

Registrars described unconditional teaching as beneficial: *"The quality of the teaching that they give you is not dependent on the amount of reading or the amount of prior knowledge that you have on that topic. They're willing to teach you for your sake of learning"* (P3, Y3). Registrars appear to benefit from visual aids.

Well-structured and individual teaching was noted as advantageous: *"I prefer to be taught one-on-one in theatre where I'm able to ask questions"* (P13, Y1). Registrars greatly appreciated theatre-recreated simulation training: "*The simulation lab was quite a standout moment for me because a lot of efforts and planning and realistic in-theatre scenarios are recreated very well. And there's a lot of feedback afterwards*" (P12, Y4).

Non-beneficial teaching methods

Teachers who are patronising, controlling and menacing was perceived as a hinderance to learning: *"I don't respond well to a very hostile or condescending environment"* (P10) and "*sometimes you end up being so intimidated and anxious that even the things that I know just tend to disappear in that moment."* (P13, Y1).

Registrars found consultants who only encourage self-learning as non-beneficial: *"I don't appreciate being told to just go read up"* (P7, Y1). Consultants who are unwilling to teach were considered unhelpful: *"I think the ones that deserve a below average score are the ones who are just not interested in in teaching"* (P14, Y2). Consultants with unrealistic expectations of registrars was inhibitory to learning.

Instances where theory was recited without interpretation was noted to be less helpful: *"Reading blatant theory to me which you would be able to read yourself in a textbook. I don't think that's of any benefit"* (P2, Y2).

Consultant traits for excellent teachers

Consultants who try to improve registrars' knowledge was perceived as beneficial: *"They're teaching you because they want you to actually gain the knowledge"* (P16, Y2) and *"they're passionate about it and they want you to learn and they want to teach you"* (P11, Y2). The majority of registrars agreed that passion is an excellent trait for teaching.

Consultants who are able to tailor their teaching to the registrar's current academic level and simplify complex topics were said to be invaluable: *"They take this seemingly impossible concept and they break it down into these very understandable bite-sized pieces"* (P11, Y2). Other traits of excellent teachers were noted as consultants that are: "*Calm*" (P13, Y1), "*approachable*" (P17, Y4), "*friendly*" (P9, Y2), "*patient"* (P19, Y1), "*relatable"* (P2, Y4), "*knowledgeable"* (P6, Y2), "*punctual"* (P20, Y4), "*engaging"* (P1, Y1) and "*non-judgmental"* (P18). Registrars appreciated consultants who make them feel competent, who lead by example and "*don't have an ego*" (P12, Y4). Consultants who are *"relaxed and confident in their ability"* (P15, Y1) was deemed a good trait.

Teaching excellence

Registrars expressed feelings of disharmony between the level of academic excellence required and the level actually achieved: *"I think that it's incredibly inconsistent"* (P4, Y3). Registrars acknowledged that there was too little high quality in-theatre teaching for them

to assess the teaching program as excellent: *"The formal teaching is pretty poor in theatre"* (P5, Y3). Whereas, some registrars expressed the availability of teaching as excellent: "*I think (we have) got access to teaching, which is very good*" (P2, Y4).

Suggested improvements

Most registrars suggested more high-quality teaching during working hours: *"If we could improve the one-on-one teaching that takes place in theatre"* (P13, Y1). Registrars noted that making use of all learning opportunities might alleviate pressure for doing teaching outside working hours: *"There's a lot of teaching moments that are not utilized"* (P18, Y3).

Registrars expect allowance for optimal attendance to protected teaching times during working hours and that condensing tutorials in this time might alleviate the need for after-hours teaching: "*The important things seem to happen outside of the protected teaching time. I think protected teaching time could be much better used in order to lessen the burden and lessen the workload of teaching happening outside of work time"* (P2, Y4) and *"if we could do some of the morning or the evening tuts on the Wednesday (protected time) and use that time more wisely"* (P15, Y1). Another suggestion was *"separating junior protected teaching and senior protected teaching"* (P16, Y2) to alleviate pressure of all registrars joining one slot for protected teaching and to have targeted teaching based on level of skill: *"Everyone in the department is at a different level (academically) and then the tutorials are done all together"* (P19, Y1).

Registrars noted the need for quality rather than quantity of teaching: *"Thinking anesthetics from sometimes quarter past six in the morning until quarter past six at night, it's not great or it's not like a sustainable way of learning"* (P15, Y1). Some registrars suggested that knowing tutorial topics before, helps them to prepare for teaching.

Lastly, registrars were ambivalent regarding learning teaching skills during registrar training. However, some registrars suggested potential benefit of teaching consultants on how to teach to aid their role in this capacity: "*It's (training consultants) very important, especially if you stay in a system where you're expected to teach and some people are not (good) teachers*" (P8, Y4).

Discussion

Consultants are an integral component to the success of the Wits Anaesthesia training program. The purpose of the program is to produce registrars that are clinically proficient and able to practice independently. There are many expectations of consultant anaesthetists in academic hospitals, teaching being arguably the most important (12, 24).

The operating theatre is one of the main teaching settings however patient care and service delivery are the primary objectives. Strategies have to be employed to enhance registrar teaching in this chaotic environment, whilst ensuring appropriate patient outcomes (6, 13).

A study in the developed world noted that trainees felt that learning came second to research (25). In a resource constrained setting, reaching the balance between teaching and service delivery is often difficult (14). This was acknowledged by registrars at Wits, where service provision was prioritised before learning.

Registrars at Wits expressed that teaching is suboptimal. The most common criticism was of inadequate teaching time in theatre. In the literature, below average scoring of clinical teachers was for inadequate amounts of intraoperative teaching (24). Consultants however have other priorities and not all consultants are naturally good at teaching. Most clinical teachers are not required to show competency in teaching to be educators (26).

In this study, registrars noted improved teaching when they initiated learning, which was in agreement with the literature where consultants reported that teaching was enhanced when registrars appear keen, interested, seek out challenges and identify areas of learning (3). Registrars at Wits felt that in-theatre learning opportunities should be utilised to lessen the burden of out of service hours teaching. The theatre environment is replete with learning opportunities which should be utilised (3). The literature indicates that registrars feel that their clinical skills improve when taught in theatre and they require higher quantity of interactions with consultants in order to learn (3, 24) which was reflected in the results of this study.

Multiple studies observed that providing consultants with feedback on their teaching improves teaching (6, 12, 25). This is not a practice at Wits Department of Anaesthesia but was suggested by participants as a possible point of improvement.

Senior registrars in this study regarded teaching favourably and felt that teaching of seniors was more directed. This is contrary to the findings in the literature where senior anaesthesia trainees were more critical of teachers (25). In this study registrars appreciate being trusted to be primary clinical decision makers.

Traits for excellent teachers identified by Wits Anaesthesia registrars were similar to those in the literature (1, 5, 6, 24). It was suggested that each medical speciality might identify different core teacher characteristics (26). However, in this study, the positive traits identified were similar to those noted in the literature as beneficial to all specialist medical fields.

A qualitative study conducted in the Wits Anaesthesia Department by Cuthbert et al. in 2017 indicated that registrars felt that their training time put a high burden on their personal and family lives (27). Despite capturing demographic data, there was no significant difference noted in participants' comments based on age, gender or ethnicity. There was no appreciable difference in how registrars experience teaching based on relationship status or whether they had children.

The primary investigator, as fellow junior registrar to the participants, was able to relate closely to the findings of this study. There was a deep understanding of some opinions

shared with participants and an ability to recognise opposing opinions because of a mutual experience of the learning environment within the department. The personal views of the primary investigator contribute to the positionality which forms part of the expression of this research (28).

Limitations to this study include the introduction of bias by the primary researcher by potentially misinterpreting feelings of participants. The primary investigator clarified unclear statements during interviews to avoid bias. Care was taken to ensure the feelings of the participants were accurately reflected. However, the data is subject to some degree of interpretation by the researcher.

The findings of this study are specific for the Wits Department of Anaesthesia and may not be generalisable. The results may however be transferable to other departments of anaesthesia as teaching in these departments may subject to the same human factors of teaching as at Wits. Views of consultants as teachers were not considered. Coding was mainly done by the primary investigator and may be subject to introduction of bias. Supervisors were consulted throughout the process and unanimity was reached on finalised codes.

Conclusion

The experience that anaesthesia registrars have of consultant teaching at Wits is multifaceted. This study highlighted aspects of the teaching environment that registrars feel is positive while also uncovering areas where improvement may be sought. Specifically, the access to teaching and focused teaching around specialised sub-fields of anaesthesia were noted to be good. Simulation training sessions were seen as beneficial and registrars commended the consultant teachers who exhibit traits they deemed crucial to be excellent teachers. Areas of improvement were identified as ensuring the protected teaching times are used for appropriate topics, utilising all learning opportunities and involving consultants in registrar feedback to allow for an improved teaching environment. Furthermore, it was suggested that consultants receive training with the aim of equipping them for their role as teachers. Finally, the identified areas of improvement highlight the benefits of using registrar feedback in teaching and reiterates the importance of both registrars and consultants being active participants in training the next generation of specialists. Further research might delve in to the experience of consultant anaesthetists as teachers, to better understand the complex dynamic between teacher and learner, in an academic medical environment.

Financial disclosure and conflict of interest

The authors do not have any conflicts of interest to declare.

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Appendix 1: Proposal

A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits

Madeleine Mattushek

Student number 350984

Supervisor Dr Mithasha Gayaparsad

Department of Anaesthesiology

Co-Supervisor Dr Sameerah Mahomed

Department of Anaesthesiology

1. Introduction

The training of registrars, in an academic postgraduate institution, requires the input of exceptional clinical teachers who supervise their clinical skill development, the application of theoretical knowledge and who stand as role models for what it means to be an anaesthetist in practice (1-3). Teaching in anaesthesia takes place both in and out of the theatre environment. Both are required to develop well-rounded, clinically proficient specialists (4).

Various practice elements have been identified for out of theatre teaching that focus on aspects to improve teaching outcomes. These include summaries of key concepts, the addition of visual or audio aids, organised presentations, monitoring registrar understanding throughout a session, exploring topics to meet clearly outlined objectives as set out in curricula, demonstrating interest in the topic and showing thorough understanding of subject matter (5, 6). These strategies have been adopted by the Wits Department of Anaesthesia to form the backbone of the teaching programme comprising: didactic tutorials, simulation training, as well as morbidity and mortality meetings. This formal teaching is shared between different hospitals forming the Wits circuit and in light of the Covid-19 pandemic, has evolved to include virtual platforms (7).

In addition to the theoretical knowledge from didactic teaching, an integral component of the growth and competence of a registrar is the development of situational awareness. Situational awareness is a skill acquired by anaesthetists that is important in clinical practice and essential for crisis resource management. It can be defined as the gathering of information from various "inputs" which include clinical, monitoring, social and experience (1, 8), which is then interpreted and used to anticipate future events (9). It is from this ability to integrate information from different aspects of theatre, that makes anaesthetists proficient at managing most cases by the end of their specialist training (8). The training of registrars should include development of similar skills, habits and routines, so that they too can ultimately manage complex cases with confidence and without supervision. These practices should be taught in a manner that is beneficial to registrars so that they too may become competent specialists (10-13).

There are different characteristics that describe a good clinical teacher and these characteristics may be defined differently by the registrar as compared with the consultant (14). Some characteristics identified in the literature include being committed, flexible, having good communication skills, being patient, giving feedback, being supportive and actively involving the registrar in teaching (1, 6, 11, 14-16).

Teaching is one of the core competencies as outlined in the CanMEDS Physician Competency Framework (17), however during registrar training at Wits, there is no formal training on how to teach. This is common in the field of medical education (2, 5). According to Harms et al. (18), it is often not necessary to show proficiency in medical teaching or clinical supervision, to become a teacher. Rather, a study by St Pierre and Nyce (19) noted that the teaching agenda of a consultant is often determined by their own perspectives that had developed during the time they were in training. These perspectives are then passed down to registrars during training to enhance their practice.

According to Ramani and Leinster (2), clinical teaching can be challenging because the consultant has to assume many different roles. These roles include providing information, being a role model, being involved in facilitating and assessing the registrar and combining different resources to ensure teaching of the prescribed curriculum. They further define some of the obstacles to clinical teaching as a lack of clear objectives and expectations, teaching not aligned with the level of experience of the registrar, focusing on fact recall instead of problem solving, not actively involving registrars and not leaving adequate time for discussion and feedback. Consultants who have not been properly prepared nor orientated to teach, but who are expected to do so, may be frustrated and find that teaching is difficult (2).

In the South African setting, the benefit of in-theatre teaching stems from registrar's direct "hands-on" management of clinical cases under the supervision and guidance of consultants. This results in learning of tacit knowledge that would not be passed along if not for these specific circumstances. According to Pope et al. tacit knowledge is lessons learned and skills obtained through clinical experience (12).

Lessons taught in this manner results in the development of the required clinical memory for consultant practice (4).

It has been investigated and confirmed that the quality of teaching has a significant impact on the performance of a registrar and various factors have been found to be contributory (4). At the forefront of these are the consultant and registrar's shared role as patient carer, as well as those of teacher and learner respectively. Furthermore, the busy and noisy theatre environment with many interruptions by monitors, nursing staff and the surgical team all contribute to teaching complexity.

A study by Morriss et al. (20) showed that in many resource-limited anaesthetic educational programs from low and middle income countries, such as in Africa and Middle-East Asia, the teaching is done by overworked consultants. In these settings, monitoring and evaluation is often lacking and requires both qualitative and quantitative assessment to ensure educational adequacy (6, 20, 21). Overall, assessment and feedback on the teaching skills of postgraduate medical teachers has been found to be a powerful tool to improve clinical teaching (1, 4, 6, 22, 23).

Cuthbert et al. (24) conducted a qualitative study within the department in 2017 that described how registrars experience their training at Wits. The main themes identified included: the "roller coaster experience" of learning, with different positive and negative experiences; the struggle for academic achievement pertaining to achievement of academic milestones; the lack of protected teaching time; the stress of providing a service while the main aim is to learn; balancing academic and personal life and the personal growth registrars undergo to become a consultant. Many of these themes have since been addressed to encourage ongoing academic excellence in the Wits Department of Anaesthesia.

Then in 2021, a quantitative study was conducted by Khan et al. (21) that evaluated education in the theatre environment at Wits. It was concluded that theatre, as educational environment for registrars, was seen in a positive light. However, there were areas identified that could be improved including: the workload, supervision and support; the perception of teachers and teaching; learning opportunities and orientation to learning as well as the perception of the theatre atmosphere. The quantitative design that was followed in the study by Khan et al. (21) allows little

room for registrars to elaborate on their personal experiences of teaching. The focus was on teaching within the theatre environment rather than collecting and assessing the experience of registrars with regard to consultant teaching. The author concluded that a qualitative study would allow for further exploration of these identified themes and which could contribute to the improvement of teaching within the department.

2. Problem Statement

There is little research looking into the registrar's training experience as influenced by consultants in the South African context. Registrars' experiences and feelings are not always openly expressed, especially not where these can be analysed anonymously and used to the benefit of the training program within the department. The researcher therefore postulates that analysing the experiences of registrars can lead to ways in which the teaching excellence within the department can be improved.

3. Aims

The aim of the study is to describe the registrars' experience of consultant teaching in the department.

4. Objectives

- To describe the expectations that registrars have of consultant teaching.
- To describe how different registrars experience teaching by consultants in the department, based on:
    - The level of their training
    - Formal teaching platforms at Wits
    - Informal teaching platforms at Wits.
- To describe the perceived influence that consultants have on the development and readiness of registrars to become consultants or practice independently.
- To identify the traits and teaching methods which registrars feel contribute to a good consultant teacher.
- To describe whether the teaching excellence desired by the department is reflected in the registrar's training experience.

- To explore suggested improvements identified by registrars.

5. Research assumptions

The following assumptions will be made in this study

Consultant – an anaesthetist who functions at the level of a medical specialist and who is responsible for the training and supervision of registrars.

Registrar – an anaesthetist who is in training of becoming a medical specialist, enrolled in a registrar training program affiliated with an accredited tertiary institute.

Senior registrar – a registrar who has completed a cardiothoracic rotation during their registrar training.

Junior registrar – a registrar who has not yet completed a cardiothoracic rotation, usually within the first two years of registrar training.

Wits circuit – the academic hospitals that registrars rotate at during their registrar training within the Department of Anaesthesia at Wits. These include Charlotte Maxeke Johannesburg Academic Hospital (CMJAH), Chris Hani Baragwanath Academic Hospital (CHBAH), Helen Joseph Hospital (HJH) as well as Rahima Moosa Mother and Child Hospital (RMMCH).

6. Demarcation of study field

The study population will be defined by the registrars employed within the Department of Anaesthesia at Wits, for the duration of the study.

The interviews will take place in private spaces at one of the four Academic hospitals of the Department – CMJAH, CHBAH, HJH or RMMCH.

7. Ethical considerations

Ethics approval will be obtained from the University of the Witwatersrand Department of Human Research Ethics Committee before commencement of the study. Permission to conduct the study will be obtained from Prof. P Motshabi (Academic

Head of Department Anaesthesia of Wits) as well as the Clinical Heads of Departments at the four main teaching hospitals (Dr. P Mogane – CHBAH, Prof. E Oosthuizen – CMJAH, Dr. B Gardner – HJH, Dr. T Kleyenstuber – RMMCH) (see Appendix A-E).

Registrars will be invited electronically to take part in the interview process. There will be no obligation to complete the interview and registrars may retract participation at any given time. Registrars who choose to be part of the study will be asked to sign two consent forms: one to allow participation in the interview and data collection process and another, to consent to an audio recording and storage of the interview, which will be used for transcribing and data analysis at a later stage (see Appendix G).

The data collected will be kept confidential. Each participant will be assigned a study number to maintain anonymity. A list of the participants' study numbers will be kept in a password protected format. This will be kept for six years after which it will be permanently destroyed.

In the event that a participant experiences distress or any other emotional discomfort, they will be referred to the departmental psychologist for further assistance with these matters. Registrars will also be informed, via the information sheet, of the people that they can approach privately for any other problems that may arise.

The study will be conducted according to the principles of the Declaration of Helsinki (25) and the South African guidelines of good clinical practice (26).

8. Data collection

8.1 Research design

A qualitative study design will be used. Data will be collected during semi-structured interviews.

8.2 Study population

All registrars that are part of the Department of Anaesthesia at Wits will be eligible to form part of the study population.

8.3 Study sample

8.3.1 Sample method

A mixed sampling method will be used. Initially, a convenience sample method will be used to include the most readily available people to be included in the study (27). This sample method is chosen seeing as it is most suited to answer the research question and will be most practically enabling (28). Invitations will be sent electronically to all registrars in the Department of Anaesthesia at Wits. Registrars fulfilling inclusion criteria will be offered dates and times available to schedule interviews. Reminders will be sent to eligible registrars who have not scheduled interview sessions.

The researcher will continue sampling until participants include registrars of different genders, seniority, social background, race and rotating hospitals to enhance credibility of the research (9, 29). Purposive sampling may be employed to ensure adequate representation of the registrar group. Purposive sampling entails identifying and sampling specific individuals or groups of individuals (30). Groups not represented in the initial interviews will be identified and invitations will be sent to individuals in these groups to ensure adequate representation. Interviews will be continued until adequate data has been sampled which fulfil criteria of saturation.

8.3.2 Sample size

In contrast to quantitative studies, qualitative research does not define a specific sample size to determine adequacy of data collection and the sample size is usually determined during the time of data collection (28). It would be up to the researcher to determine adequate data sampling which may be supported by concepts such as "rich rigor". According to Tracy et al. (29) this entails the researcher asking themselves questions around collected data which may include whether or not there

is adequate data to support conclusions made by the researcher, whether or not the timeframe for collecting data was adequate, whether or not the objectives set out was achieved with the sample population studied, and whether or not suitable procedures were followed during data collection and analysis. Other factors contributing to sample size will include the quality of data provided by participants. In the case where fewer participants share their experiences eloquently, fewer interviews may be required to answer for the determined objectives (27, 31).

Data collection will be continued until saturation has been achieved. Saturation for this study will be defined as the point at which newly collected data analysed, does not result in newly identified ideas or themes (27, 28, 31, 32). Interviews will be continued until all themes have been saturated and newly collected data yields ideas that have been recorded previously, thus resulting in redundancy (33).

8.4 Inclusion and exclusion criteria

Inclusion criteria

- Registrars that have completed at least six months of registrar training in the Department of Anaesthesia at Wits.
- Participants who consent to complete the interview as well as consent to audio recording of the interview.

Exclusion criteria

- Registrars that have not completed six months of registrar training.
- Registrars who withdraw their consent to participate in the study.

8.5 Collection of data

Data will be collected through semi-structured interviews with participants. The interviews will be conducted in a private location where minimal disruptions are expected. The interviews will be conducted in English, which is the teaching medium used in the Department of Anaesthesia at Wits.

A data collection sheet (Appendix H) will be completed for each participant. This will serve as additional information to add perspective to the answers given by each participant during interviews including seniority, personal social circumstance, demographics and current hospital rotation. This will enhance the credibility of the collected data (29).

Interviews will be offered to participants as individual or group-based as it is recognised that some registrars may feel uncomfortable to discuss sensitive matters in a group setting. Groups will consist of no more than three participants. The interview will be guided by predetermined, open-ended questions posed by the primary researcher. The researcher is at liberty to ask additional questions and follow-up questions in light of a specific course of the discussion. The researcher will not only be limited by the predetermined questions and if recurring themes are noticed during previous interviews, the researcher will be allowed to make additions to the question list as the interview process progresses (34).

Audio recordings will be made during the interviews using the primary researcher's electronic devices which will be password protected and which will later be transcribed by the primary researcher alone. At the start of the transcription process the interviews will be depersonalised. Depersonalisation will include removal of names of all members of the department as well as names of hospitals.

Data analysis will occur concurrently with data collection. This will aid in determining data saturation as well as identifying new themes that emerge which may require exploration in subsequent interviews and amendment of the interview question guide (28).

9. Data analysis

Standards of qualitative data analysis will be followed (34). This would include analysing data periodically during data collection to identify themes, theme saturation and themes requiring further exploration in following interviews. Theme identification would be done by coding of collected data. MAXQDA software will be used to code and analyse the data and identify themes within the data pool (35). This would aid exploring the relationship between different themes and ultimately assist in

development of the theoretical explanation for the emerged themes (28). Once data is grouped by themes, the researcher will discuss these themes with relevant quotations as supporting evidence and conclusions will be drawn.

10. Significance of the study

One of the key objectives of Wits Anaesthesia is to provide teaching to registrars in order to support their development and aid their transition to becoming specialist anaesthetists. The teaching is mainly provided by consultants in the department. Teaching is experienced subjectively by individual registrars; what may be helpful to some may be less helpful to others (36). There is no current formal or informal assessment of consultant teaching by registrars or a platform for registrars to express how they experience this teaching.

Multiple sources have identified the value of assessing the impact of consultants as teachers, on registrars (1, 4, 10, 19, 37, 38). The researcher anticipates that the benefits will be highlighted by exploring the registrars' experiences of consultant teaching in the department. This may lead to remarkable and valuable insights on teaching as it is currently conducted. The researcher hopes to identify the aspects that most registrars find helpful (or unhelpful) in their learning experience. This could yield beneficial findings for consultants who teach, as well as registrars who may consider joining the department as consultants, in a teaching capacity, at the end of their specialist training.

11. Validity and reliability of the study

Validity and reliability of the study will be ensured by choosing an appropriate study design and method, by hosting interviews with a representative group of registrars in the department and by continuing the interview process until ample data has been obtained. The primary researcher will collect data alone. The data will be analysed anonymously to protect all parties involved. MAXQDA will be used to analyse data and identify themes in an unbiased fashion. Clear documentation about the research process, including the decisions made and actions completed will be included to ensure transparency (29).

The five criteria as identified by Lincoln and Guba will be used to ensure trustworthiness of this qualitative study (39, 40). The first four criteria (1985) comprise credibility, dependability, confirmability and transferability with the fifth criteria added in 1994 as authenticity.

Standards to report qualitative data as identified by O'Brien et all. (34) will be used. These include the formulation of a problem or research question, description and justification of the methods used to collect data, quotations from collected data to substantiate inferences made during the conclusion, elaboration on the boundaries and limitations of the study as well as relation of findings to available literature to support or perhaps contrast these findings (34).

12. Potential limitations of the study

This is a qualitative study looking subjectively at the registrars' teaching experience. These experiences may be influenced by the level of progress of an individual registrar as well as by factors outside the department. The interviewing skill of the primary researcher may have an influence on the data that the study yields. By employing a convenience and purposeful sampling method, the researcher will be accountable to ensure that data is collected from a representative group. No minimum number of participants has been specified and it will be up to the researcher to ensure continuation of data collection until saturation is reached. Interviews will be offered to participants as individuals or in a small group of up to three participants. This may be seen as advantageous to ensure that interviewing conditions are optimal for each participant to share their views, however, analysing data from individual versus group interviews may introduce bias in answering of questions by participants. Being a single-institution study, data collected from this study may have results that pertain only to the Anaesthesia Department at Wits and does not generalise to other departments. Registrars trained at different institutions may be taught in a different teaching culture where experiences may differ.

13. Project outline

Activity	Apr '22	May '22	Jun '22	Jul '22	Aug '22	Sep '22	Oct '22	Nov '22	Jan '23	Feb '23	Mar '23	Apr '23	May '23
Proposal													

Proposal submission													
Ethics approval													
Postgraduate approval													
Data collection													
Data analysis													
Draft article													
Submission													

14. Financial plan

The researcher will bear the cost of stationery and transport to interview locations. The Department of Anaesthesia will bear the cost of the paper to print and bind the proposal for ethics and post graduate approval.

Description	Price per page	Number of pages	Total
Proposal	R1	24 x2	R48
Ethics	R1	10 x2	R20
Postgraduate form	R1	2 x2	R4
Information letter & consent form x2	R1 x 3	20 x 3	R60
Final report	R1	+/- 70 x2	R140
Binding final research report			R500
Total			R772

The researcher's personal electronic devices will be used to audio record interviews and transcribe data from these recordings.

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Appendix 2: Human Research ethics committee clearance certificate

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R49 Dr M Mattushek

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M220859

NAME: (Principal Investigator)	Dr M Mattushek
DEPARTMENT:	School of Clinical Medicine Department of Anaesthesia Medical School University
PROJECT TITLE:	*A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at* Wits
DATE CONSIDERED:	2022/08/26
DECISION:	Approved unconditionally
CONDITIONS:	This approval applies only to the study sites listed in Annex 1 attached Further sites may be added on presentation of evidence of management approval to the HREC (Med)
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office - <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Drs M Gayapersad and S Mahomed
APPROVED BY:	Dr N Naran, Co-Chairperson, HREC (Medical)
DATE OF APPROVAL:	2022/11/03

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **August** and therefore reports and re-certification will be due in the month of **August** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator

06/03/2022
Date

Annex 1

Protocol No. M22/08/59 **Dr M Mattushek**
Study sites approved under this Clearance Certificate

Study site	Date of HREC (Med) Approval
Charlotte Maxeke Johannesburg Academic Hospital	2022/11/03
Chris Hani Baragwanath Academic Hospital	2022/11/03
Helen Joseph Hospital	2022/11/21
Rahima Moosa Mother and Child Hospital	2022/11/28

CB Penny

Dr CB Penny
Chair: HREC (Medical)
University of the Witwatersrand, Johannesburg

Date: 2022/11/28

Appendix 3: Graduate studies committee approval

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

03 August 2022
Person No: 350984
PAG

Dr M Mattushek
47 Wexford Avenue
Parkview
Abbotsford
2192
South Africa

Dear Dr Madeleine Mattushek

Master of Medicine in Anaesthesia: Approval of Title

We have pleasure in advising that your proposal entitled *A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

Appendix 4: Turnitin report

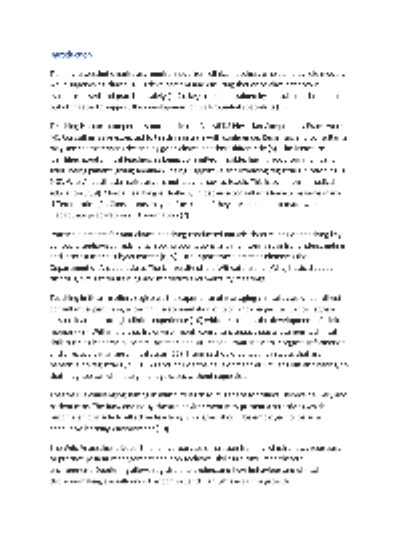
turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Madeleine Mattushek
Assignment title:	Final submission (all, regardless of course/programme)
Submission title:	Turnitin 1-1.docx
File name:	Turnitin_1.docx
File size:	701.64K
Page count:	13
Word count:	4,660
Character count:	28,121
Submission date:	12-Mar-2024 09:15AM (UTC+0200)
Submission ID:	2318434217



Turnitin 1-1.docx

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Appendix 5: Author instructions

1. Overview

The Journal of Graduate Medical Education (JGME*)* focuses on the education of allopathic and osteopathic residents and fellows, including transitions into and out of residency and fellowship, as well as graduate medical education (GME) research and innovation, such as faculty development, curriculum, assessment, and program evaluation. Manuscript submission categories include original research, educational innovations, reviews, brief reports, perspectives, personal essays about teaching and learning, and letters to the editor concerning previously published JGME articles.

Manuscripts should pertain to GME or related topics and be of potential interest to at least 2 medical specialties or subspecialties, as *JGME* is read by all specialties and subspecialties. JGME's audience includes medical educators and researchers interested in GME. JGME does not publish papers focused primarily on undergraduate medical education or the education of other health professionals.

Additional resources are provided at the end of this document.

2. TYPES OF MANUSCRIPTS

Please follow the general format indicated in the JGME templates for **Quantitative** and **Qualitative** research papers (eg, Original Research, Educational Innovation, Brief Report).

Original Research: Includes all content areas in GME. Research manuscripts will meet standard quality criteria for education scholarship, as reflected by choice of research design, sample size, and measurement instruments for quantitative research, standard rigorous methods for qualitative research, and accepted quality standards for quality improvement and implementation science. Original Research submissions must use the JGME structured format for the abstract and manuscript content.

3. WORD COUNT AND BOX/TABLE/FIGURE LIMITS

Category	Manuscript, words	Abstract, words	Boxes/Tables/Figures, No.
Original Research Quantitative Qualitative	Generally less than 2,500 Generally less than 3,500	≤ 250	≤ 5

Note: Manuscript word counts exclude the title page, headings, acknowledgements, figures, tables, boxes, abstract, references, and supplemental material. Abstract word counts *do* include the headings.

Note: All studies that use a non-published survey or questionnaire *must* include a copy of the survey or questionnaire as supplemental online material.

4. COMPONENTS OF A MANUSCRIPT SUBMISSION

A. Cover letter

- The cover letter should contain a very brief introduction to your manuscript.
- If there are compelling reasons to exceed the word count limits in the manuscript, provide these reasons in the cover letter.
- Manuscripts submitted may not have been previously published in print or electronic format, and cannot be under consideration by another publication or medium.

B. Title page

Please order the title page as follows:

- Title of article
- Author names and degrees, institutions/affiliations and roles (eg, PGY-2 Resident, Program Director, Associate Professor of Medicine, etc)
- Prior or related publications, and prior abstract or poster presentation (if appropriate)
- Acknowledgements (if appropriate)
- Disclaimer (if appropriate)
- Corresponding author professional contact information (business address, phone number, fax, and e-mail)
- Word counts for the abstract and the manuscript text

Authorship: Only persons who have actively participated in the research, writing, and editing of the manuscript should be listed as authors.

- Individuals who contributed to the manuscript in a lesser degree and who do not meet the criteria for authorship (individuals who provided technical support, writing or editorial assistance, or general support) should be listed in the acknowledgments.
- Anyone who contributes to the writing must be either listed as an author or acknowledged in the acknowledgements; ghost authors are not permitted. Note that this does not apply to individuals who edit a manuscript for style, grammar, or clarity.
- If an author who contributed cannot be contacted, that author must be included on the author roster, and the lack of sign-off must be noted in the cover letter.
- Authors with questions about authorship should consult the Committee on Publication Ethics (COPE) guidance on what constitutes authorship.

C. Abstract

- A structured abstract is required for research articles (Original Research, Educational Innovation, Review, Brief Report) and should follow the Background, Objective, Methods, Results, and Conclusions (BOMRC) format.
- The abstract must include the year the study was conducted, in the Methods section of the abstract (as well as the main text).
- The abstract must include the total number of eligible participants, and the actual number of participants (quantitative papers, surveys). The percentage must be calculated and included in the Results section of the abstract (as well as the main text). Qualitative research should include the number of participants and how they were recruited.
- Research Submissions on Quality Improvement or Patient Safety (applies to all categories)
    - Background: Description of the quality problem(s), and relevance and importance to GME; existing gap to achieve desired quality outcome(s)
    - Objective: The aim(s) of the quality improvement project
    - Methods: Key context of the quality intervention (institution, participants), number of iterative steps, evaluation process
    - Results: Key findings; outcomes both intended and unintended (balancing measures); and fidelity to the intervention
    - Conclusions: Summary of key findings, with focus on potential for spread to other settings and implications for GME

D. Manuscript Sections for Research Papers (Original Research, Educational Innovation, Review, Brief Report)

Introduction

- Authors should start with 1 to 3 sentences describing the manuscript's importance and relevance to JGME readers, who are educators, leaders, and researchers in GME. Limit this presentation of importance and relevance of the topic to 1 short paragraph.
- The next 2 paragraphs should be a concise description of the existing literature highlighting the evidence gap(s) the study will attempt to answer. What is not known but should be known?
- The final paragraph will be 1 to 2 sentences stating the objective or hypothesis of the study or review in the order they will be addressed in the Methods, Results, and Discussion sections.

Methods

- Descriptions must be sufficiently detailed to allow others to replicate the approach, and must include feasibility information (time, costs/materials, and acceptability) as relevant.
- Research papers should include the underlying theoretical construct used in the work.
- Specific sections, in order (quantitative papers):
    - Setting and participants: brief, clear narratives on setting(s), subjects, and the year the study took place
    - Interventions: clearly and thoroughly described. Use supplemental material if needed to be clear and thorough.
    - Outcomes measured
    - Analysis of the outcomes
    - IRB statement

- Qualitative papers will also include justification for chosen theoretical construct and methods, investigators stance toward topic and participants, and methods to ensure rigor and trustworthiness.
- Sample size and statistical power: Quantitative studies must consider sample size, and use appropriate statistical tests, with attention to ß-error/power calculations and adjustments for multiple comparisons, if performed.
- If survey or assessment instruments are used, include literature on prior validity evidence for survey and assessment instruments, or a description of the authors' efforts to provide validity evidence for the instruments. If the instrument is homegrown with no collection of validity evidence, the authors should state this. Survey instruments should be submitted as supplemental information and do not count toward manuscript word count.
- Review manuscripts will additionally include methods to assess the quality of evidence gathered.
- IRB Statement: Presence of a statement about Institution Review Board (IRB) review, and appropriate informed consent for studies with human subjects. A statement about this must appear at the end of the Methods section of the manuscript, and must include the name of the body that gave approval or passed judgment for exemption. When relevant, informed consent should be documented. Manuscripts from nations where education research is not usually reviewed by an ethics committee should state how the project was reviewed, according to the standards of their nation.

Results

- Outcomes should match the study question and be objective (ideally, outcomes should go beyond self-reported or self-assessed).
- Results should be presented in the same order as they were addressed in the objectives and the methods.
- General results, such as the number of participants and demographic information, and secondary results (eg, reliability of the instrument) should be presented first, followed by the primary results.
- Interventions should describe feasibility and acceptability data, either measured explicitly or estimated (specify which).
- Supply numerator and denominator as well as percentages for findings. All surveys must report response rates.
- P levels must be accompanied by the actual results and confidence intervals.
- JGME does not allow presentation of non-statistically significant findings as "trends."
- Present the most important findings—to include negative as well as positive—in the manuscript; present the rest of the findings in tables and figures.
- Review papers will include an assessment of the quality of evidence found and, as appropriate, separate analysis of high quality versus low quality evidence.

Discussion

- The first paragraph should briefly summarize the most important, surprising, or unique findings from the study in 1 to 3 sentences.
- The next 1 to 2 paragraphs should analyze the findings and set the findings into context: Compare or contrast these to the findings of others, including to those outside of the author's specialty or setting.
- The following paragraph should discuss the effects that the study or project limitations might have on the validity of your findings. This includes external validity, or generalizability, and internal validity, or the likelihood that your findings are true. Authors need to explore

alternative explanations of their findings and suggest other study questions or designs that might uncover different results. Limitations should not be presented as a list.
- JGME does not allow discussion of the strengths of your findings.
- The last paragraph should contain 1 to 2 sentences that describe specific research steps that might follow from your study.
- Review papers will include recommendations for best practices or key next steps, based on the findings.
- The discussion should not contain a summary of the introduction, methods, or results.

Conclusions

- Conclusions should be brief and conservative.
- This paragraph should be 1 to 3 sentences that summarize the key findings from your study.
- No next steps or future research should be included here, except for Review papers.

For additional guidance in writing manuscripts, particularly when reporting specific types of research design studies, please see the resources section at the end of this document.

E. Tables, Figures, and Boxes

Boxes. Should be used for single cell tables, such as bulleted ideas. Boxes should be cited within the text where appropriate and should be placed after the References. A title should be provided.

Tables. Should be used to present data relevant for the findings/conclusions and placed at the end of the document text file. Each table should be numbered in sequence using Arabic numerals (ie, Table 1, 2, etc).

Figures. Use of figures is strongly encouraged to present concepts and process flow in a concise manner. Figures should be provided as separate, individual files. A brief title should be provided.

- The following file formats can be accepted: Microsoft Word, PDF, Excel, PowerPoint, .jpg, .tiff, .gif.
- Each figure should comprise a single file, with resolution of 300 dpi or higher. Figures should be submitted in grayscale only.
- Figures should be cited consecutively in Arabic numerals in the text.
- Figure legends should be limited to 200 words and should contain sufficient explanation to allow figures to be interpreted without reference to the text.
- Figures must be submitted in a form that permits reproduction without retouching or typesetting. Lettering and labeling should be large enough to allow reduction for page layout.

If figures, tables, or boxes have previously been published, it is the responsibility of the author(s) to obtain permission from the copyright holder to reproduce them in JGME. Appropriate credit text must be included in the figure legend. Documentation of permission to reproduce must be sent with the manuscript during submission.

Photographs. Should be used to present models, simulation set-ups, or other images that aid understanding, and should be high-quality images that can be scaled to fit the layout.

Supplemental online content. JGME requires authors to share survey and assessment instruments, forms, and interview outlines used for survey research. Authors are also encouraged to share video or audio files and other relevant data as supplemental data at the time of first manuscript submission. These additional files will not be displayed in the print form of the article, but will be made available in the online version. The editorial office reserves the right to convert figures or tables to online supplemental material.

Authors should list all supplemental content consecutively at the end of the manuscript. This should include the type of material submitted, should be clearly labeled as "supplemental content," and be cited consecutively in the text.

F. References

All references must be numbered consecutively in the order they are cited in the text, tables, or legends. Please follow AMA Manual of Style (https://www.amamanualofstyle.com) when formatting the list of References. Abbreviations of journal names must follow the MEDLINE format. Citations in the reference list should contain up to 6 authors followed with 'et al' for references with more than 6 authors. All references must be provided as citations in the text using superscripted numbers (ie, [1,2,3]). Footnotes in tables or figures use superscripted letters (ie, [a,b,c]).

G. Word Use

JGME encourages clear, accurate and specific language that does not overstate findings. To that end, authors should adhere to the following word use:

- "Significant" should only be used in the statistical sense.
- "Impactful" should be avoided and "impact" used sparingly.
- Use "program" instead of "programmatic."
- Use "function" instead of "functionality"
- Do not refer to "adult learning theory" as adult differences are not supported by evidence
- "Qualitative" should only be used for studies following rigorous qualitative methods. Consider "open-ended responses" or "feedback" instead. Using open-ended comments does not allow the paper to qualify for the increased word count afforded to qualitative studies.
- Do not use the word, "providers." Choose the specific term, or if a generic term is needed, consider, "clinicians." Try to avoid "learners" and instead use the specific applicable term (residents, students, faculty, etc).
- Use the ACGME terms of "wellness" to describe an intervention, or "well-being" to describe a person.
- When describing what is being appraised: "Assessment" refers to people, and "evaluation" refers to programs.

Appendix 6: Approval from CEOs of CMJAH, CHBAH, HJH and RMMCH

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL
UNIVERSITY OF THE WITWATERSRAND
Cluster Research Committee
7 Jubilee Rd, Parktown 2196, Johannesburg
Enquiries: Office of the CEO
Ms. T. Ndlovu; Tell: 011 488 4211 Fax 011 488 3753
Ms L. Nkosi Tel: 011 488 3500
Email: Lindiwe.Nkosi@wits.ac.za

17 October 2022

Dear Dr Madeleine Mattushek

The Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) Research Cluster Committee has reviewed your request to research "A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits.

The Research Committee is reviewing your application. Please note research at Charlotte Maxeke Johannesburg Academic Hospital is granted provided that;

1. Charlotte Maxeke Johannesburg Academic Hospital will not anyway incur or inherit costs as result of the said study.
2. Your study shall not disrupt services at the study sites.
3. Strict confidentiality shall be observed at all times.
4. Informed consent shall be solicited from patients participating in your study.

The data collection to be started only after obtaining the Human Research Ethics Committee (HREC) *unconditional approval*.

Kindly note that it is a requirement at CMJAH that for *unconditional approval* to be granted, all pending documents highlighted below are to be submitted as soon as they are available or within 3 months, and if not applicable, kindly elaborate. Failure to comply with the above-stated requirements may result in the withdrawal of this research's approval at CMJAH.

Head(s) of Department(s) Approval Letter	**Provided – CMJAH clinical and academic HODs**
Human Research Ethics Committee Approval	**HREC provisional approval letter provided**
The National Health Research Database Registration	**Pending. Evidence of NHRD application provided**
Data Collection Sheets	**Not provided**
Informed Consent Documents	**Not provided**

Yours sincerely,

Ms G. Bogoshi
Chief Executive Officer

GAUTENG PROVINCE

REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 13th October 2022

TITLE OF PROJECT:

A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits.

UNIVERSITY: Witwatersrand

Principal Investigator: Dr M Matlushek

Department: **Anaesthesia**

Supervisor : Dr M Gayaparsad /Dr S Mahomed

NHRD Number: GP_202210_020

Permission Head Department (where research conducted): Yes

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

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

Recommended
(On behalf of the MAC)
Date: 13/10/2022

Approved/~~Not Approved~~
Hospital Management
Date: 14/10/2022

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Gauteng Department of Health
Helen Joseph Hospital
Enquiries: Dr. V. Mukansi
Research Committee: Chairperson
Tel: (011) 489 0305/1087
Fax: (011) 485 1036
Email:Murimisi.mukansi@wits.ac.za

03 November 2022

To whom it may concern

Subject: HELEN JOSEPH HOSPITAL RESEARCH COMMITTEE APPLICATION

PROTOCOL TITLE: A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits

Principal Investigator: Madeleine Mattushek

Ethics Clearance: Pending

Principal Investigator: Madeleine Mattushek

Department: Helen Joseph Hospital

Committee Recommendations
The Committee is giving you Conditional access while awaiting the final ethical clearance certificate from the University of Witwatersrand.

It is the duty of the researcher to collect the data to the relevant department after the Research Committee approved the study.

Dr. V. Mukansi
Chairperson of HJH Ethic and Research Committee

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Rahima Moosa Mother and Child Hospital
Enquiries: Adjunct Professor Ashraf Coovadia
Tel: 011 470 9284/9100
Email: Karen.Marshall@wits.ac.za

TITLE OF RESEARCH PROJECT:
"A QUALITATIVE STUDY ON THE TEACHING AND TRAINING PRACTICES OF CONSULTANT ANAESTHETISTS AS EXPERIENCED BY REGISTRARS AT WITS"

NAME OF SUPERVISOR:
Dr Mithasha Gayaparsad

NAME OF RESEARCHER:
Dr. Madeleine Mattushek
Department of Anaesthesiology
University of the Witwatersrand

NHRD REF NO: GP_202210_020

Dear Mattushek,

Permission is granted for you to conduct the research as indicated in the title above.

The terms under which this permission is granted is contained in the Researcher Declaration form that you have signed. Failure to comply with these conditions will result in the withdrawal of such permission.

It is crucial for you to inform the Research Coordinator, Karen Marshall of the actual start and end dates of your study. This could be done by e-mail.

Should the study commence more than 12 months after receipt of this approval letter you will have to go through the process of applying again.

You are strongly advised to keep a signed copy of the declaration form to ensure that the terms of this agreement are always complied with.

Yours sincerely,

DR FREW BENSON
Senior Clinical Manager
Rahima Moosa Mother and Child Hospital
2022.11.21

Appendix 7: Permission letter by Anaesthesiology Head of Department

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
FACULTY OF HEALTH SCIENCES
WITS SCHOOL OF CLINICAL MEDICINE
DEPARTMENT OF ANAESTHESIOLOGY
Tel:(011)488 4344

30 May 2022

Postgrad Office

School of Clinical Medicine

Faculty of Health Sciences

University of the Witwatersrand

To Whom It May Concern

Permission To Conduct Research: Dr Madeleine Mattushek- Student Number: 350984

This is to confirm that I have read and given permission for **Dr Madeleine Mattushek** to conduct research at in the Department of Anaesthesiology towards his/her Mmed project titled ***"A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits"***

Thank you.

Assoc. Prof. P Motshabi Chakane

Ass Prof P. Motshabi Chakane
HOD Wits Anaesthesia
HOD Cardiac Anaesthesia
Tel: +27 (0)11 488 4344
Cell: 083 432 1994
Email: palesa.motshabi@wits.ac.za
Website: www.wits.ac.za
Charlotte Maxeke Johannesburg Academic Hospital, 6th Floor, Area 30/10, Jubilee Road, Parktown, Johannesburg

WITS UNIVERSITY
WITS SCHOOL OF CLINICAL MEDICINE
FACULTY OF HEALTH SCIENCES

Appendix 8: Permission letter by Clinical Heads of Departments of CMJAH, CHBAH, HJH and RMMCH

29 May 2022

Department of Anaesthesia

Charlotte Maxeke Johannesburg Academic Hospital

Parktown

2196

Professor E. Oosthuizen

Head of Department – Charlotte Maxeke Johannesburg Academic Hospital

Wits Anaesthesia

Re: Permission to Collect Data for Masters in Medicine Anaesthesiology Research – Dr Madeleine Mattushek

Dear Professor Oosthuizen,

I would like to request your permission to conduct a study in the Wits Department of Anaesthesia for my Masters in Medicine (M Med) research.

The title of my M Med is: A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits. In order to meet the aims and objectives of this study, interviews with voluntary registrars in the department will be conducted to ascertain their experience of teaching by consultants. The interviews will be held in private spaces at each hospital (Charlotte Maxeke Johannesburg Academic Hospital, Chris Hani Baragwanath Academic Hospital and Helen Joseph Hospital). Care will be taken to ensure that service delivery will not be affected by these interviews.

I anticipate that this study will yield results which confirm that the teaching within the department is of a high standard and potentially highlight areas that could be improved to maintain or further elevate the teaching standard.

Permission will be obtained from Professor Motshabi as Academic Head of the Department to conduct this study. Approval by the Human Research Ethics Committee and Graduate Studies Committee will also be obtained before commencement of the study. Thereafter, data will be collected until an appropriate sample size is obtained.

Respectfully Yours,

Madeleine Mattushek, Researcher

Approval granted (Yes) No

Professor Oosthuizen

Date: 31/5/2022

27 May 2022

Department of Anaesthesia

Charlotte Maxeke Johannesburg Academic Hospital

Parktown

2196

Doctor P. Mogane

Head of Department – Chris Hani Baragwanath Academic Hospital

Wits Anaesthesia

Re: Permission to Collect Data for Masters in Medicine Anaesthesiology Research – Dr Madeleine Mattushek

Dear Doctor Mogane,

I would like to request your permission to conduct a study in the Wits Department of Anaesthesia for my Masters in Medicine (M Med) research.

The title of my M Med is: A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits. In order to meet the aims and objectives of this study, interviews with voluntary registrars in the department will be conducted to ascertain their experience of teaching by consultants. The interviews will be held in private spaces at each hospital (Charlotte Maxeke Johannesburg Academic Hospital, Chris Hani Baragwanath Academic Hospital and Helen Joseph Hospital). Care will be taken to ensure that service delivery will not be affected by these interviews.

I anticipate that this study will yield results which confirm that the teaching within the department is of a high standard and potentially highlight areas that could be improved to maintain or further elevate the teaching standard.

Permission will be obtained from Professor Motshabi as Academic Head of the Department to conduct this study. Approval by the Human Research Ethics Committee and Graduate Studies Committee will also be obtained before commencement of the study. Thereafter, data will be collected until an appropriate sample size is obtained.

Respectfully Yours,

Madeleine Mattushek, Researcher

Approval granted: Yes/No

Date: 30 May 2022

Doctor Mogane

27 May 2022

Department of Anaesthesia

Charlotte Maxeke Johannesburg Academic Hospital

Parktown

2196

Doctor B. Gardner

Head of Department – Helen Joseph Hospital

Wits Anaesthesia

Re: Permission to Collect Data for Masters in Medicine Anaesthesiology Research – Dr Madeleine Mattushek

Dear Doctor Gardner,

I would like to request your permission to conduct a study in the Wits Department of Anaesthesia for my Masters in Medicine (M Med) research.

The title of my M Med is: A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits. In order to meet the aims and objectives of this study, interviews with voluntary registrars in the department will be conducted to ascertain their experience of teaching by consultants. The interviews will be held in private spaces at each hospital (Charlotte Maxeke Johannesburg Academic Hospital, Chris Hani Baragwanath Academic Hospital and Helen Joseph Hospital). Care will be taken to ensure that service delivery will not be affected by these interviews.

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Respectfully Yours,

Madeleine Mattushek, Researcher

Approval granted: Yes/No

Date: 30 May 2022

Doctor Gardner

2 June 2022

Department of Anaesthesia

Charlotte Maxeke Johannesburg Academic Hospital

Parktown

2196

Doctor T. Kleyenstuber

Head of Department – Rahima Moosa Mother and Child Hospital

Wits Anaesthesia

Re: Permission to Collect Data for Masters in Medicine Anaesthesiology Research – Dr Madeleine Mattushek

Dear Doctor Kleyenstuber

I would like to request your permission to conduct a study in the Wits Department of Anaesthesia for my Masters in Medicine (M Med) research.

The title of my M Med is: A qualitative study on the teaching and training practices of consultant anaesthetists as experienced by registrars at Wits. In order to meet the aims and objectives of this study, interviews with voluntary registrars in the department will be conducted to ascertain their experience of teaching by consultants. The interviews will be held in private spaces at each hospital (Charlotte Maxeke Johannesburg Academic Hospital, Chris Hani Baragwanath Academic Hospital, Helen Joseph Hospital and Rahima Moosa Mother and Child Hospital). Care will be taken to ensure that service delivery will not be affected by these interviews.

I anticipate that this study will yield results which confirm that the teaching within the department is of a high standard and potentially highlight areas that could be improved to maintain or further elevate the teaching standard.

Permission will be obtained from Professor Motshabi as Academic Head of the Department to conduct this study. Approval by the Human Research Ethics Committee and Graduate Studies Committee will also be obtained before commencement of the study. Thereafter, data will be collected until an appropriate sample size is obtained.

Respectfully Yours,

Madeleine Mattushek, Researcher

Approval granted: (Yes) No

Doctor Kleyenstuber

Date: 8/6/2022

Appendix 9: Interview guide

Interview question guide

- How important are consultants in your anaesthesia training and why?
- How do you experience the consultant teaching in the department overall?
- How do you experience in theatre teaching by consultants?
- How do you experience formal tutorials?
- How do you experience Wednesday afternoon protected teaching?
- In your opinion, which consultant teaching methods do you learn best from?
- Which (if any) teaching methods do you feel does not contribute to your learning?
- Are there any standout teaching moments during your registrar time that you would like to highlight (positive or negative)?
- Can you identify any traits in consultants that have a positive or negative influence on how you experience teaching?
- When you think of consultants who are excellent teachers, what do they do differently to consultants that are average teachers?
- Do or don't you feel that the teaching you receive from consultants will adequately prepare you for upcoming exams?
- Do or don't you feel that the teaching you receive from consultants enable you develop to become a consultant yourself?
- Do or don't you have suggestions or recommendations of how your teaching experience could be improved?
- Do or don't you feel the need that you should be trained on how to teach?

Appendix 10: Informed consent and Consent for Audio recording

Informed consent form for participant registrar

I _____ (Name and Surname), have read and understood the above information letter. I hereby give consent to be interviewed for the Masters in Medicine of Anaesthesia study titled: "A qualitative study on the teaching and training practices of consultant anaesthetist's as experienced by registrars at Wits".

I understand that

- I am a willing participant of this study.
- I have read the information sheet, I have asked about and am satisfied with the answers with regards to the conduction of this study.
- I am satisfied that the study will be carried out in an ethically sound manner as approved by the Medical Human Research Ethics Committee.
- I have considered the method of data collection proposed for the study and I am satisfied that all of the information obtained during this interview will be kept confidential and that only the primary researcher will have access to the raw data.
- All reasonable measures will be taken to protect my anonymity as far as possible.
- I do not have to answer any questions that I do not wish to answer, and that I may withdraw from the interview process at any point without consequence.
- The results from this study may be written up as a report, made into an academic presentation or may be published in a journal.

I, the participant, hereby give / do not give (please circle) consent to take part in the interview for the abovementioned study.

_____ _____

Signature of participant Date

I, Madeleine Mattushek, hereby confirm that the participant has given their informed consent before conduction of the interview, and that the participant has been made award of the nature of this study.

_____ _____

Signature of researcher Date

Informed consent for audio recording of interview

I _____ (Name and Surname), have read and understood the above information letter. I hereby give consent to be interviewed for the Masters in Medicine of Anaesthesia study titled: "A qualitative study on the teaching and training practices of consultant anaesthetist's as experienced by registrars at Wits".

I understand that

- The interview will be audio recorded by the interviewer and that the interviewer will be the only one with access to the audio recordings.
- The interview audio will be transcribed and de-identified by use of a numbering system to ensure confidentiality.
- The transcribed recordings will be destroyed 6 years after completion of the study.

I, the participant, hereby give / do not give (please circle) consent to take part in the interview for the abovementioned study.

_____ _____

Signature of participant Date

I, Madeleine Mattushek, hereby confirm that the participant has given their informed consent before conduction of the interview, and that the participant has been made award of the nature of this study.

_____ _____

Signature of researcher Date

Appendix 11: Data collection sheet

Data collection sheet

Name and Surname of participant

_____

Study participation number allocated _____

Year of birth _____

Race (circle): Black / Indian / Coloured / Asian / White / Other _____

Relationship status _____

Do you have children? _____

Current year of study (circle): 1st year / 2nd year / 3rd year / 4th year / extended time

Base hospital (where you are employed) _____

Current hospital rotation _____

Date of interview _____

Prior to interview commencement the participant will be reminded that:

- They are under no obligation to do the interview and may withdraw at any point
- Everything said during the interview is confidential
- They can contact any member from the Anaesthesia wellness team, should the need arise
- The interview will be audio recorded
- Honesty is expected at all times during the interview
- They should answer questions in as much detail as possible.