EVALUATION OF THE POSTGRADUATE FAMILY MEDICINE DECENTRALISED TRAINING PROGRAMME AT THE UNIVERSITY OF WITWATERSRAND, SOUTH AFRICA, USING THE LOGIC MODEL

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A thesis completed by published work, submitted to the School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, in fulfilment of the requirements for the degree of Doctor in Philosophy

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DECLARATION

This thesis is submitted by publication, using the format required by the Faculty of Health Sciences, University of Witwatersrand, South Africa, for the degree of Doctor of Philosophy in Family Medicine. I, Neetha Joe Erumeda, student number 0110649J, declare that this thesis is my original work and has not been previously submitted fully or partly for any degree or examination at this or any other university.

I have read the University regulations on referencing and plagiarism in the Wits Plagiarism Policy. I am aware that plagiarism is wrong and that the University of the Witwatersrand may take disciplinary action should plagiarism be found in this work.

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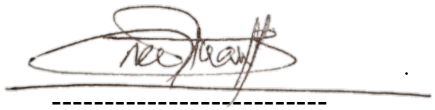

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Date: 27 February 2024

DEDICATION

I dedicate this thesis to my dear husband, Dr. Joe Erumeda, and my three children, Elina, Roana and George, who constantly provided support and patience to complete my work. I appreciate the time and space they gave me to consolidate my work on my thesis in the past years.

I also dedicate this work to my parents, Mr. P. D. Skaria and Rosily Skaria and my sisters and brother, whose strong motivation and prayers paved the way for the completion of my thesis.

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DECLARATION: STUDENT 'S CONTRIBUTION TO ARTICLE(S)

I, Neetha Joe Erumeda, student number 0110649J, declare that this is my own work and that I contributed adequately towards research findings published in the article(s) stated below, which are included in my thesis.

Signature of the student:

Date: 27 February 2024

Primary Supervisor: Ann George

Signature of the Primary Supervisor

Date: 27 February 2024

<u>Agreement by co-authors</u>: By signing this declaration, the co-authors listed below agree to the use of the article(s) by the student as part of her thesis

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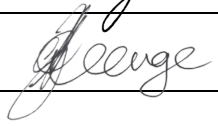
3rd Author	Ann Zeta George		27 February 2024

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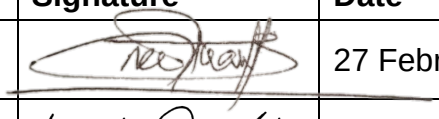
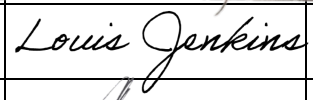
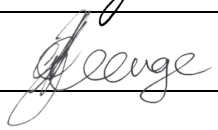
1st Author	Neetha Joe Erumeda		27 February 2024
2nd Author	Louis Stander Jenkins		27 February 2024
3rd Author	Ann Zeta George		27 February 2024

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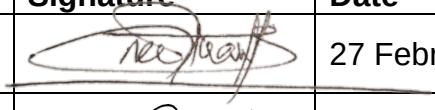
1st Author	Neetha Joe Erumeda		27 February 2024
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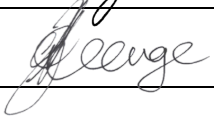
3rd Author	Ann Zeta George		27 February 2024

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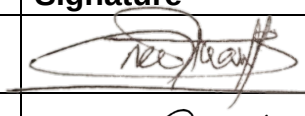
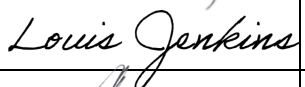
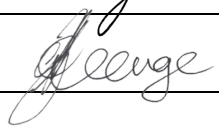
1st Author	Neetha Joe Erumeda		27 February 2024
2nd Author	Louis Stander Jenkins		27 February 2024
3rd Author	Ann Zeta George		27 February 2024

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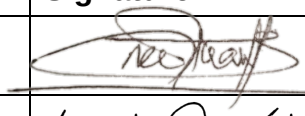
1st Author	Neetha Joe Erumeda		27 February 2024
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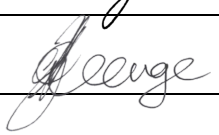
3rd Author	Ann Zeta George		27 February 2024

ABSTRACT

Postgraduate family medicine decentralised training programmes were implemented in South Africa about 15 years ago, but the University of the Witwatersrand's programme has not been comprehensively evaluated. This study evaluated the programme using a complex programme evaluation logic model based on linearity theory. This theory assumes ideal inputs and processes produce good programmatic outputs and outcomes. Resources and support were evaluated as inputs, postgraduate supervision and workplace-based learning as processes, supervisory feedback as outputs and workplace-based assessments as outcomes.

A parallel convergent mixed-methods instrumental case study was conducted with purposively-sampled family physicians (n=11) and trainees (n=11) from five decentralised training sites. Semi-structured interviews were audio recorded, transcribed verbatim, and analysed inductively using MAXQDA 2020 software. Descriptive statistical analysis was conducted on components of registrars' learning portfolios (scores, supervisory feedback, and skills competence) and examination results using Stata 14.2 software. An integrative analysis involving transforming the quantitative results to qualitative findings and drawing meta-inferences was conducted. The integrated findings were used to modify the initial logic model and identify key recommendations to optimise the programme.

The integrative analysis identified the need for more material and human resources, university and district management support, and standardised resources, supervision, and learning practices. Supervisors' knowledge, skills, and behaviours varied across sites and their feedback was insufficient regarding soft skills like clinical reasoning and patient negotiation. Workplace-based assessments did not meet the required standards across training years and districts. Interpersonal interactions with patients, peers, supervisors and other professionals, engagement in district activities, promoted learning. Registrars' professionalism and self-learning need improvement.

The key recommendations include more explicit national guidelines, sufficient support from the provincial department, university, and district management, well-maintained

infrastructure, sufficient skilled supervisors, more professional development training for supervisors, protected time for registrar learning, and better use of self-learning and reflection.

Emulating successful contextual adaptations while addressing challenges across sites contributes to thriving decentralised training programmes in district health systems. An improved understanding of the concepts and their interrelationships in training programmes could be translated to similar decentralised training platforms across medical disciplines of sub-Saharan Africa or low-middle income countries.

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ABBREVIATIONS AND ACRONYMS

ACGME	Accreditation Council for Graduate Medical Education
AoL	Assessment of learning
AfL	Assessment for learning
AMEE	Association for Medical Educators in Europe
COVID-19	Coronavirus Disease 2019
COPC	Community-oriented primary care
CME	Continuing Medical Education
CMSA	The Colleges of Medicines of South Africa
CHC	Community Health Centres
DCT	Decentralised Clinical Training
DOPS	Directly Observed Procedural Skills
ECG	Electrocardiogram
ENT	Ears, nose, throat
FP	Family physician
FM	Family medicine
FCFP	Fellowship of the College of Family Physicians
GP	General Practitioner
HIC	High-income countries
HIV	Human Immunodeficiency Virus
ICT	Information and Communications Technology
LP	Learning portfolio
LMIC	Low-and middle-income countries
Mini-CEX	Mini-Clinical Evaluation Exercise
MMR	Mixed Methods Research
MO	Medical Officer
PHC	Primary Health Care
RG	Registrar
RTC	Regional training centre
SA	South Africa
TB	Tuberculosis
UI	Uncertainty Interval
UK	United Kingdom
US	Unites States
Wits University	University of the Witwatersrand
WBL	Workplace-based learning
WPBA	Workplace-based assessments
WHO	World Health Organisation
OSCE	Objective Structured Clinical Examination
SAAFP	South African Academy of Family Physicians
QA	Quarterly Assessment

MY POSITIONALITY STATEMENT

I am a specialist family physician in the Ekurhuleni Health District (one of the five districts affiliated with the University of the Witwatersrand). I have a joint appointment position with the University and the Gauteng Department of Health. I have spent over 13 years as a clinical trainer and supervisor in a family medicine decentralised peri-urban training site. I have been a district education coordinator for over five years, organising and leading training activities centrally in the Ekurhuleni Health District.

My teaching has fostered an interest in the supervisory role and its effectiveness and impact on teaching and learning in the districts. Being both a practising FP and a clinical supervisor and being involved in training postgraduate registrars, medical students, and clinical associates has allowed me to observe and identify the strengths and challenges of training, supervision and registrar learning opportunities. I became aware of several supervision-related challenges, which motivated this study to evaluate and make recommendations to improve the registrar training programme.

CHAPTER 1 BACKGROUND TO THE STUDY

All people have access to the health care services they need, when and where they need them, without financial hardship, including the full range of essential health services, from health promotion to prevention, treatment, rehabilitation, and palliative care.

World Health Organisation[1]

1.1. INTRODUCTION

This chapter discusses the need for global medical education to be transformed. Transformation is essential to train health workers to meet community needs. The discipline of family medicine (FM) is positioned to address healthcare challenges at the community level. However, family physicians' roles and responsibilities translate differently across high and low-middle-income countries, contributing to differences in postgraduate FM training. The chapter describes the postgraduate training at the University of the Witwatersrand (Wits University), South Africa (SA). Finally, the chapter provides the rationale and purpose of the study reported in this thesis.

1.2. TRANSFORMING MEDICAL EDUCATION

1.2.1. Global healthcare challenges

The latest estimated global health worker shortage is 17.6 million, with a shortage of 2.6 million medical doctors.[2] Health worker shortages are more prevalent in the low-income and middle-income countries[a] of Africa and South-East Asia[2] that have to contend with high disease burdens. For the purpose of this study, the acronym LMICs denotes the combined category of low-income and middle-income countries. The burden of communicable diseases, which includes tuberculosis, malaria, human immune deficiency virus (HIV) and other tropical diseases and injuries, is much higher in LMICs compared to high-income countries (HICs) (Figure 1.1). Communicable diseases and maternal, perinatal and nutritional problems contribute to nearly half of the deaths in LMICs, compared to HICs, where non-communicable diseases account

[a] The World Bank classifies countries into high, upper-middle, low-middle, and low-income based on national per capita income. The World Bank's regional classification identifies four regions: Europe and Central Asia, Middle East and North Africa, Sub-Saharan Africa, South Asia and others.[3]

for more than 85% of the deaths.[4] In addition to higher mortality rates, life expectancy in LMICs lags considerably behind HICs due to the high disease burden.[4]

Figure 1.1: Composition of causes of death by WHO region (Source: World Health Statistics 2019).[9]

1.2.2. African healthcare challenges

African countries display a static or increasing disease burden, as several recent estimates and reports illustrate. Communicable diseases and maternal, perinatal, and nutritional conditions account for 52.9% of all-cause mortality, with non-communicable diseases and injuries contributing to the remainder (Figure 1.1).[4] The United Nations Children's Fund Annual Report (2022) estimated more than five million deaths of children under five in 2021, primarily in LMICs.[5] The number of children suffering from severe wasting is increasing in sub-Saharan Africa.[5] The maternal mortality rate has been declining since 2000. However, it remains the highest in sub-Saharan Africa, with maternal deaths of 196 000, 80% uncertainty interval (UI) 180 000 to 235 000 and a maternal mortality rate of 542 (80% UI 498 to 649).[6] Other causes of mortality include road injuries, intimate partner violence, homicide or suicide, obesity at all ages, anaemia in women, and harmful use of alcohol and tobacco.[6]

1.2.3. Training fit-for-purpose healthcare workers

More healthcare workers must be trained and retained in LMICs, especially in Africa, where the most acute health worker shortages are experienced.[2,4] However, these health workers must be fit for purpose. They must be able to address their community health needs, which requires promoting social accountability among newly qualified trainees.[7] The World Health Organisation (WHO) defines medical schools' social accountability as

> *"…the obligation to direct their education, research and service activities towards addressing the priority health concerns of the community, region, and/or nation where they have a mandate to serve. The priority health needs are to be identified jointly by governments, healthcare organizations, health professionals, and the public*."[7]

The WHO also mandates the expansion of training platforms from academic centres to primary health care (PHC) facilities and in communities to develop health professionals with an adequate skills mix to meet the needs of the larger community.[8] This shift in health professions training will address the global disease burden by providing greater attention to the health needs of communities.[7,8]

Educational institutions must modify curricula, training, infrastructure, and admission criteria and improve health workers' skills and competencies to address the global disease burden.[8,9] The WHO Global Human Resources for Health Strategy promotes good planning, education, and investments for creating a healthcare workforce.[2] This WHO global strategy advocates a workforce based on general practice and FM to deliver community-based, patient-centred, continuous, equitable and integrated patient care.[2]

Health workers must be capacitated and skilled by clinical trainers with adequate experience and competencies to train them in the PHC context.[2] FM is a recognised clinical speciality based in PHC, providing comprehensive care to patients of all ages

and sexes, addressing common health conditions, and attending to patients and families in their context.[10,11] FM's adaptability and generalist nature uniquely position the discipline to respond to the healthcare needs of populations in LMICs.[10,11]

Globally, sub-Saharan Africa carries the largest disease burden, with less than 3% of the global health workforce available to address the disease burden in Sub-Saharan countries.[11] Whereas patients in HICs have direct access to medical practitioners as the first point of care,[11] nurse practitioners, mid-level healthcare workers, midwives, and other multidisciplinary team members provide the first point of healthcare for patients attending PHC clinics in many sub-Saharan African countries, referring patients to medical practitioners only when necessary.[12] Addressing the huge global disease burden prevalent in sub-Saharan Africa, especially in the primary care settings, will require a well-developed system of PHC services with cost-effective management of available resources to ensure accessible, comprehensive, co-ordinated, and people-centered care associated with positive health outcomes.[10] This level of PHC can only be achieved by addressing the need for skilled primary care health workers such as primary care nurse practitioners, general practitioners and family physicians (FPs). The latter approach rightfully positions FM as a critical discipline in PHC contexts. Family practitioners can support, guide, and capacitate different health worker cadres, including medical and PHC nursing practitioners, to optimise healthcare.[2,12]

South Africa's health policy[13] aligns with the WHO Sustainable Development Goal (SDG)3, which requires the country to "provide good health and wellbeing to its people." [14] The disease burden in SA, a middle-income country with a Gini coefficient of 0.65,[15] is comparable to that of other LMICs. The country has a high prevalence of HIV, TB and other non-communicable diseases, maternal and perinatal and nutritional conditions. It is thus critical to achieve universal health coverage and reduce maternal, neonatal, and child mortality, infectious diseases, and premature mortality from non-communicable diseases.[16] South Africa is implementing a National Health Insurance

(NHI)[b] to achieve universal health coverage[1,13] and address its disease burden by focusing on healthcare provision in underserved and disadvantaged communities.[17] However, attending to community needs is compromised by challenges in district health systems, such as poor access to various healthcare services, resources and drugs.[18] Inappropriate health professional skills aggravate this situation due to training primarily in higher education institutions with a hospital-centric focus, not prioritising skills needed at a PHC level.[18]

1.3. CONCEPTIONS OF FAMILY MEDICINE

Since its inception in the 1960s and 70s, FM has been conceptualised differently and operationalised by different scopes of practice and types of FM training worldwide.[19] "When FM is a recognised speciality of medicine providing comprehensive care to individuals and families, an FP is a medical practitioner with specialist training to provide comprehensive care to all individuals regardless of their age, sex or the type of health problem."[10,20] The use of the term 'general practitioner' varies across countries. Some countries use it only for medical practitioners with FM specialist training, while others use the term for those without training.[10,21] In the United Kingdom (UK) and the Netherlands, FM is primarily based in general practice clinics in the community, and specialists with postgraduate FM training are called general practitioners (GPs); in New Zealand, they are called specialist GPs. In Canada, doctors with specialist training are known as FPs and offer a broad range of services, providing "cradle-to-grave" care.[19] In the United States (US), primary care practitioner is a general term referring to FM practitioner, nurse practitioner, physician assistant, paediatrician and geriatrician, but those who have training in FM are called FPs. Latin American countries use different terms for FM, and their training differs considerably from a fully public-based system in Cuba to a mix of private and public facilities in other Latin American countries.[22] Many Middle Eastern countries have established hospital-based training programmes but with slightly different scopes of practice.[19] In highly

[b] National Health Insurance is a health financing system designed to pool funds to provide universal access to quality and affordable health care to all South Africans based on their health needs.

populated countries like China and India, FM is impacted by a lack of government support and trainees' preference for other specialities.[19,22]

1.3.1. Variations in roles and responsibilities of family physicians

Family physicians have different roles and responsibilities in different countries.[10] According to the CanMEDS-Family Medicine 2017 competency framework, Canadian family physicians are expected to be expert communicators, collaborators, leaders, health advocates, scholars, and professionals.[23] The Canadian FP scholarly role involves reflective practice and incorporates the teaching role of the trainees and other healthcare professionals.[23] This role includes planning learning activities with trainees, providing feedback, serving as role models, providing a safe learning environment, and evaluating trainees and the training programme.[23] In the US, the Accreditation Council for Graduate Medical Education (ACGME) requires FM physicians to have an annual performance evaluation on their teaching abilities and engagement with the programme, including supervising trainees, attending to their well-being at sites, promoting high-quality patient care, acting as excellent role models, and creating an effective learning environment.[24] The FP roles developed in HICs like Canada influenced FM scope and FPs roles and responsibilities in many African countries, including SA.[25]

1.3.2. Development of postgraduate family medicine training in Africa

Postgraduate FM training is in different phases of development in many African countries.[10,19,21,26,27,28,29] After being implemented at the University of Pretoria, SA, in 1968,[10] FM was established in many African countries such as Nigeria, Uganda, and Ghana.[19,21] Family medicine was only recognised as a speciality in SA in 2007.[30] Many African countries, such as Kenya and Botswana, later established academic FM training complexes to strengthen their PHC services.[28,30,31,32] In a 2019 workshop involving 18 African countries, an in-depth evaluation of postgraduate FM training across countries using the stages of change model occurred.[33] According to this model, African countries were grouped into pre-contemplation, contemplation, action, maintenance, relapse, and permanent change stages depending on the development and progress of their FM training programmes. Family medicine training programmes

permanently changed in SA, Nigeria, and Ghana, while those in Rwanda and Tanzania remained static. Some countries, such as Uganda and Kenya, had regressed from their initial progress. The participants in the 2019 workshop re-iterated the importance of the PHC focus in FM training to meet the community's needs.[33] A shortage of FPs, insufficient essential stakeholder support, resources, funding, and career opportunities negatively influenced the progress of FM as a discipline in various African countries.[21,33]

In 2008, a Delphi consensus process formalised the critical principles of FM and the FP scope of practice in a sub-Saharan African context.[25] Six roles were identified: care provider,[c] consultant,[d] capacity-builder,[e] clinical trainer and supervisor,[f] champion of leadership and governance, and community-oriented primary care. Despite these defined roles, FM specialists' scope of practice, descriptions, and responsibilities still vary across sub-Saharan African countries.[21] Specialists with FM training were called FPs in SA, but GPs in Nigeria. Similarly, the working contexts of FPs in different African countries ranged from hospitals (district, regional and tertiary), public and private clinics or health centres, and general private practices in rural and urban areas to university, academic and administrative roles.[34] In many countries, key stakeholders recognised FM as a speciality, providing future career paths for trainees, and FPs were recognised as all-round specialists and part of the district health system.[21,33]

1.3.3. Postgraduate family medicine training in South Africa

After FM was recognised as a speciality, SA medical schools implemented full-time postgraduate FM programmes in 2008. This competency-based training was primarily decentralised, based in district health systems, with support from the affiliated universities. Simultaneously, accredited four-year Masters' training programmes were established in all nine existing medical schools, with a national exit examination administered by the Colleges of Medicines of SA (CMSA).[30] The learning outcomes for the training programmes were integrated across universities in 2010.[35]

[c] Able to provide clinical care in patients in a district health system.
[d] Able to give support to all primary care services.
[e] Teaches and develops other practitioners or health staff.
[f] Supervises registrars, medical students, interns and clinical associates.

The implementation challenges experienced in SA mirrored those of other sub-Saharan African countries, including a lack of training posts, low trainee throughput rates, insufficient trainers, and a lack of clarity about the FP roles.[36] The perceived impact of FPs on health system performance and clinical processes, including the six identified FP roles, was evaluated using a validated FP impact evaluation tool[37] in district hospitals and PHC facilities in the Western Cape in 2016.[38] The FP impact on the SA health system was more pronounced in the district hospitals where the FPs were primarily based compared to the PHC clinics.[38] There was a greater perceived impact on the roles of competent care provider and consultant and less on those of clinical trainer or supervisor.[38] The lowest mean scores were for training components such as observed consultations, educational meetings, and supervision, highlighting the need for further improvement.[38]

1.4. DECENTRALISED CLINICAL TRAINING

Decentralised clinical training (DCT) is a recognised strategy for transforming health professions education to meet the health needs of communities.[39,40] However, the strategy has different names in different contexts and settings.[39] The definition proposed in a 2017 scoping review will be used in this report: “Training in sites away from the tertiary training centres for about six months or more.”[39] Similarly, community-based education, discipline-based clinical rotations, longitudinal clerkships, and distributed community-engaged learning decentralised training models will be regarded as viable models of DCT.[40]

Decentralised clinical training is a vital component of FM training, but its implementation varies significantly between high and low-income countries, depending on the country’s needs.[19,33] While Canada adopted a distributed learning model in training, Australia promoted DCT as a new remote rural speciality.[19] Although both are community-based medical education models, distributed learning integrates distance online learning programmes for trainees in rural communities in Canada.[41] In contrast, remote rural training occurs in rural clinical campuses and regionally based

medical schools in Australia.[40] Unlike in some HICs, DCT is still in its developmental stages in LMICs in sub-Saharan Africa, including SA.[4,5]

Irrespective of the model used, DCT offers hands-on experience of clinical and procedural skills during longer longitudinal rotations and flexible curricula underpinned by social accountability and interprofessional learning principles.[39] Decentralised clinical training has improved healthcare delivery across communities in HICs, but it must be optimised to ensure that the priority health needs in LMICs are met.[22,39]

1.4.1. Decentralised clinical training in South Africa

In 2017, the South African Association of Health Educationalists agreed that DCT is a primary strategy to meet community healthcare needs.[43] South African DCT is conducted in the community or PHC settings, such as clinics and district hospitals, in rural, urban, or peri-urban settings.[40] The NHI requires skilled health professionals such as GPs and PHC nurse practitioners to work under the leadership of FPs based in these contexts.[44] These practitioners form the backbone of the district health system. In sufficient numbers, they can provide safe and effective patient-centred health services that can impact community health outcomes.[13,38] However, FP shortages vary widely across SA provinces,[45] highlighting the critical need to train more skilled and committed FPs[46] for successful and effective DCT.

Information and communications technology (ICT), longer longitudinal rotations, a PHC focus, alignment between medical schools' mission statements and DCT, and responsive training could improve DCT in SA.[42] However, SA medical universities face many challenges. One major challenge is providing adequate infrastructure with internet connectivity to access online resources,[42] as found in other sub-Saharan countries.[28] Another challenge is creating a conducive training environment.[39] Committed and motivated supervisors must train the next generation of decentralised practitioners. Supervisors also need ongoing support in the form of orientation and training.[28,39] The DCT has the potential to provide benefits such as increased job satisfaction and professional development for supervisors.[39,47] Universities could address some of these challenges by including DCT in their mission statements,

having local onsite leadership as champions, and establishing functional partnerships to provide adequate funding.[39]

Given the lack of control and structure inherent to DCT, training programmes must be regularly evaluated and provided with feedback. Although previous studies identified some factors influencing training,[42,48,49] in-depth exploratory studies on critical aspects of DCT, trainers' and trainees' perceptions and experiences of supervision and workplace-based learning opportunities in their contexts are still lacking.

1.4.2. Supervision in decentralised clinical training

Different conceptions of supervision are prevalent, especially in DCT. The term 'supervisor' originated in professions such as nursing and mental health, which defined it as "any encounter that provides support in a clinical context, whether formal or informal, hierarchical or non-hierarchical, part of a training programme or not."[50,51] The terms 'supervision' and 'mentoring' or 'coaching', although sometimes used interchangeably, are not synonymous in educational settings.[52] The term 'mentor' addresses broader issues relating to a trainee, even by a senior colleague who is not their supervisor and is not focused on the trainee's performance.[53] Mentoring covers not just clinical work but addresses professional relationships and career plans, even extending to trainees' personal issues.[52] Launer quotes Whitmore,[54] who describes coaching as "unlocking of a person's potential to maximise their own performance."[52]

Supervision types in clinical settings include informal, clinical, educational, remedial, professional, and managerial supervision.[55] Clinical supervision, the most common type, involves discussions with trainees about the clinical management of patients in wards or clinics and case-based reflections.[56] Another common form, educational supervision, is more complex and challenging and focuses on the trainees' learning needs and assesses progress towards their goals.[57] Often, the supervisory role incorporates elements of both mentoring and coaching in these settings. Although supervision is essential in medical education, it is the least researched and developed aspect of clinical teaching.[58]

1.4.3. Workplace-based learning

Workplace-based learning (WBL) is becoming more important in medical education, emphasising informal learning opportunities at DCT sites more than formal learning at medical schools. Workplace-based learning primarily consists of informal opportunities for self-directed and self-regulated learning.

Self-directed[59] and self-regulated learning[60] use adult learning principles when trainees practice at their workplaces. Self-directed learning is "a process by which individuals identify and/or acknowledge learning needs, find resources to meet those needs, and evaluate their own achievement; it is integral to maintaining professional competence."[61] Self-directed learning occurs when people want to know more about topics of interest and mainly occurs in experiential settings.[59] In contrast, self-regulated learning refers to trainees' ability to modify their thinking, motivation and behaviour in learning.[62] Self-regulated learning occurs primarily in classroom settings where supervisors set goals.[59]

In clinical settings, WBL involves learning from others, along with self-directed learning strategies. Trainees' learning happens by 'legitimate peripheral participation' in 'communities of practices.'[63] 'Legitimate peripheral participation' means "learning occurs by engaging and becoming a full participant in a sociocultural practice."[63] Communities of practice are groups of people who share a concern or a passion for something they do, learn together, and do it better as they interact regularly.[64] Situated learning is an example of 'learning in situ' or 'learning by doing' by participation in a community of practice[64] with other learners or more senior or experienced individuals at the workplace. Other WBL practices include 'apprenticeship' where 'newcomers learn alongside old timers' on managing work while engaging them in learning.[65]

1.4.4 Workplace-based assessments

Workplace-based assessments (WPBA) are recent developments in medical education that place assessments in the authentic context of trainees' workplace during patient encounters[66] and are integral in evaluating WBL. In DCT, WPBA tools are used by clinical trainers for summative and formative assessments to collect data about trainees' performance and judge their competencies.[67] Workplace-based

assessments are in the developmental phase in training due to smaller staff and trainee numbers, fragmented resources and lack of assessment expertise.[68] Although the term educational assessment was initially used, in the last 30 years, several terms have been used to differentiate summative and formative assessments. When the term formative assessment was coined in the 1990s, the focus of assessments was to support and improve trainee's learning compared to summative assessments done for the accountability, ranking and certification of trainee's achievement of competence.[69] Later, terms such as assessment *for learning* (AfL) for formative assessments and assessment *of learning* (AoL) for summative assessments were developed. At a 2009 international conference, participants from many HICs clarified the terms AfL and AoL.[70] According to a newer definition, "Assessment *for Learning* is part of everyday practice by students, teachers and peers that seeks, reflects upon and responds to information from dialogue, demonstration and observation in ways that enhance ongoing learning."[70] Newer definitions in FM training from the ACGME (2023) define formative trainee evaluation as "monitoring a trainee's learning and providing feedback to improve learning in the context of patient care and other educational opportunities."[24] Summative evaluation is about deciding on trainee's learning and comparing it against their goals and objectives to decide on promotion to the next level of training or programme completion.[24] In summary, the most important goal of AfL is to recentre the purpose of assessment on the trainee, and the educational benefit is the trainee's growth that occurs during the assessment experience.[71]

1.5. LEARNING PORTFOLIOS AS EVIDENCE OF LEARNING AND SUPERVISION

The College of Family Physicians within CMSA, the Fellowship of the College of Family Physicians (FCFP) SA qualification examining body, specifies five national unit standards[72] and 83 learning outcomes that registrars (postgraduate trainees in SA) must achieve by the end of the three-year training programme.[73] Registrars must complete an annual learning portfolio (LP) and obtain a subminimum of 60% for each of the three years.[72]

The work compiled in the LPs must address 50 of the 83 learning outcomes identified by a panel of 31 FM experts from eight South African universities.[74] The panel also agreed on principles for registrars and supervisors, including effective registrar-supervisor relationships, regular engagement of supervisors and registrars, adequate mentoring, and a minimum of two hours of weekly formal training and supervision.[74] Compiling the LP helps registrars understand their strengths, goals, and learning needs, make individual adjustments, and identify necessary resources to progress.[75] The LPs include individualised learning plans that promote self-directed learning. Learning plans require registrars to establish learning objectives, identify the sequence of activities to achieve them, draft a timeline, identify resources, assess evidence for goal achievement, and, most importantly, self-evaluate and obtain feedback from a supervisor.[59]

The SA FM LP provides evidence of learning, stimulates reflection, and helps registrars achieve the required competencies.[72] The LP is either written or electronic, depending on university resources. The CMSA recommends using an e-portfolio over a written portfolio across all medical disciplines, including FM.[76] In addition to learning plans, the LP consists of a collection of WPBA tools which provides evidence for direct observations in the form of mini-clinical evaluation exercises (mini-CEXs),[77] directly observed procedural skills (DOPS), and the communication skills observation tool as part of formative and summative assessments.[72] The LP has sections where supervisors must provide narrative feedback on registrars' strengths and weaknesses to facilitate self-directed learning.[72] The LP also includes a logbook with the core clinical skills registrars need to attain during training. Registrars complete the logbook when rotating through PHC clinics, Community Health Centres (CHCs), district hospitals, or regional hospitals within the health districts.

1.6. FAMILY MEDICINE REGISTRAR TRAINING AT WITS UNIVERSITY

FM registrar training within the Witwatersrand health districts began after FM was recognised as a speciality.[30] Since 2008, Wits University has provided full-time registrar training in six districts, four in Gauteng and two in the North West province.

The training programme involved training at the university for all the registrars across the three years of training. The training consisted of week-long blocks, three times a year. The training in the district includes weekly contact sessions at the district regional training centres based in CHCs or the district hospitals. The district training programme includes academic activities such as clinical and non-clinical topic discussions, one-on-one clinical discussions, case-based discussions, observed consultations and procedures, and other direct observations using the different WPBA tools in the LP.

Another component of FM DCT includes the rotations in regional or tertiary hospitals, where registrars rotate through the major disciplines of internal medicine, surgery, paediatrics, and obstetrics and gynaecology. The timing and duration of rotations may vary in different districts and provinces. In some districts, registrars rotate through the different units in a district hospital for three to six months, whereas, in others, they rotate through regional or tertiary hospitals for two to three months to acquire skills, depending on the clinical disciplines.

As specified in the CMSA document, there is a need to demonstrate unified learning outcomes across the university-affiliated districts. These outcomes were partly achieved after introducing a triennial cycle training programme covering clinical and non-clinical topics in 2012. Integrating the FCFP learning outcomes into the district training schedule added value to the theoretical aspects of the programme, which was further enhanced in 2018 by adding an e-learning component. As one of the learning objectives, registrars must demonstrate that they can serve as trainers, supervisors and mentors.[35] While based in their clinic or district hospital, registrars are involved in the training of the medical students, clinical associates, community service medical officers, and other health care professionals, which, in turn, facilitates interprofessional learning to achieve this outcome.

Clinical and educational supervision is provided during FM registrar training in the Wits University districts. Clinical supervision involves clinical case discussions with registrars in clinics or hospitals, whereas educational supervision primarily identifies registrar learning needs, develops learning plans, and reviews academic progress regularly. Family physicians lead academic sessions at regional training centres

located in various districts. Participation in university activities, supervision of various assignments, and training students rotating at the facility are all part of academic supervision. Due to human resource constraints in their districts, the same FP may conduct clinical and educational supervision.

Clinical training and supervision are challenging because they involve multiple roles. Supervisors serve as physician role models, supervisors, teachers, assessors, resource developers, planners, and support individuals. In addition, they must be medical experts, managers, healthcare advocates, and scholars.[78] Family physicians are also expected to be involved in patient consultations, leadership and governance activities and serve as capacity builders for other PHC practitioners such as interns, community service doctors, medical practitioners, nurses and other multidisciplinary team members.

Family physicians who train registrars do not always have formal postgraduate health science education training. In SA, the need to train FPs involved in clinical training and supervision was identified by the FM training institutions and the South African Academy of FPs.[48] Family physicians from SA universities have participated in short courses organised by the Academy to train as clinical trainers.[79] In addition, the university provides courses in teaching and learning which trainers can attend.

1.7. THE RATIONALE FOR THE STUDY

The shift to evidence-based practices in medical education has contributed to several changes. Research on implementing programmes in clinical contexts is becoming increasingly important,[80] as is integrating primary and secondary levels of care in medical education.[81] Educational programme evaluation involves the ‘‘systematic collection and analysis of information related to the design, implementation, and outcomes of a program, for monitoring and improving the quality and effectiveness of the program.”[80] In the developmental programme evaluation, which is appropriate for complex environments requiring different stakeholder collaboration, evidence-based findings are utilised for ongoing programme improvement.[82] Evaluation and research follow the same principles but have different aims and methods. Research contributes

to the body of knowledge by asking questions about programme implementation, applying various evaluation theories or methods, and collecting evidence from their contexts.[80] Programme evaluation intends to make evidence-based decisions from research findings, which are then used to improve programmes, establish accountability, and develop actionable plans.[80] It is even more critical if the evidence is from primary care, where insufficient research is conducted when evaluating educational programmes.[83] A comprehensive programme evaluation requires "multiple evaluation questions about inputs, processes, and outputs and using numbers and narratives to provide an in-depth understanding of the programme."[80]

Existing evidence on programme evaluation derives primarily from developed countries, with few studies from other developing countries, particularly in sub-Saharan Africa. Previous studies have also focused on GP settings.[58] The Wits University FM programme has not been evaluated in-depth since it started in 2008. There is thus a need to evaluate the different programmatic components across the district-based health system to determine whether the inputs are adequate, whether activities or processes are taking place as intended, and to investigate the outputs and outcomes of the programme. The role of the FM supervisor as a clinical teacher and how they manage it, along with other functions of being a clinical care provider, capacitator and clinical advocate in busy clinical settings, has not been adequately studied in SA universities, including Wits. Such operational research is consistent with trends in the training and evaluation of medical education in its context. An in-depth evaluation of the decentralised FM training study across the different districts affiliated with Wits University could identify the strengths and challenges of training. It could contribute to developing a more effective and standardised programme locally, nationally, and in other sub-Saharan African countries.

1.8. AIM OF THE STUDY

The aim of this study was to evaluate the postgraduate FM decentralised training programme at Wits University in 2020.

The objectives of the study were as follows:

1) To describe the human and other resources available in the FM training programme at Wits University in 2020.
2) To explore the perceptions of Wits University family physicians and registrars about the supervision and learning in the FM training programme at Wits University during 2020.
3) To evaluate the evidence of supervisory feedback in the 2020 registrars' learning portfolios.
4) To assess registrars' knowledge and skills in formative and summative assessments as evidence of learning in the FM training programme at Wits University during 2020.

1.9. RESEARCH QUESTIONS

1) What human and other resources were available in the postgraduate FM training programme at Wits University during 2020?
2) What are Wits University family physicians' and registrars' perceptions of the supervision and learning in the postgraduate FM training programme at Wits University during 2020?
    2.1) What are Wits University family physicians' and registrars' perceptions of the supervision in the FM training programme at Wits University during 2020?
    2.2) What are Wits University family physicians' and registrars' perceptions of the learning in the FM training programme at Wits University during 2020?
3) What was the nature and extent of supervisory feedback in Wits University registrars' learning portfolios from 2020?
4) How and to what extent do Wits University registrars' knowledge and skills in formative and summative assessments during 2020 provide evidence of learning?

1.10. CONCLUDING REMARKS

This chapter described the study's background, context and rationale and provided the aim and research questions. The outline for the remainder of the thesis is as follows: The conceptual framework for evaluating the postgraduate FM training programme is presented in Chapter 2. Chapter 3 covers the research design and study methods, while Chapters 4 to 8 present the results. In Chapter 9, I discuss the integrated findings from Chapters 4 to 8 and present a modified conceptual model based on the study findings, followed by recommendations for implementing the model and the conclusions drawn from the study.

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CHAPTER 2: CONCEPTUAL FRAMEWORK

2.1. INTRODUCTION

This chapter discusses the purpose of research frameworks before describing the development of the conceptual framework for the study.

2.2. RESEARCH FRAMEWORKS

Research frameworks are based on theoretical constructs illuminating the research path.[1,2] Frameworks illuminating relevant theories and concepts make research findings more meaningful, ensure generalisability and expand existing knowledge.[1,2] The terms ‘conceptual framework’ and ‘theoretical framework’ are used interchangeably by some researchers,[3] but are not identical.[1]

2.2.1 Theoretical frameworks

Theoretical frameworks are based on existing theory or theories and constitute “a blueprint borrowed by the researchers to build their research enquiry.”[1] These frameworks connect researchers to the existing knowledge in their field, provide a frame of reference, and help to identify the key variables related to the phenomenon.[2] Theoretical frameworks help “to position the research in the subject researchers are working on” and “make researchers' assumptions more explicit.”[4] They allow researchers not to deviate from the confines of the theories when making a scholarly contribution[1,4] and provide signposts on how to process the new knowledge.[5]

Theoretical frameworks logically lead into conceptual frameworks with the addition of concepts originating from the researcher's domain of interest and scholarship.[1,4] While theoretical frameworks explain and predict relationships at higher levels of abstraction and generality, conceptual frameworks indicate the relationship between concepts specific to the research.[2]

2.2.2 Conceptual frameworks

Conceptual frameworks represent “the study of concepts, assumptions, expectations, beliefs, variables and theories that inform the research or a tentative theory about the phenomenon studied.”[3] Miles *et al*. (2014) describe conceptual frameworks as “the primary constructs or variables and their relationships to be studied, depicted in a graphic or narrative form, simple or elaborate, descriptive or casual, and theory-driven or not.”[6] Conceptual frameworks display “an alignment of key concepts of the study.”[4]

Researchers must explain their conceptual framework and the theory used to make research more meaningful and generalisable.[7] The theory could be derived from existing literature or observed regularities or relationships of an association of events, reflections,[2] and ideological orientation or life expectations.[8] Conceptual frameworks can borrow ideas from multiple theories instead of relying on one theory.[9] Thus, a conceptual framework is about “what we think is going on with the issues or settings or people that are planned to research” and about theories, beliefs, or prior research guiding that and researchers’ personal experiences brought forward to understand the study issues.[9]

Using a conceptual framework offers multiple advantages. Although the initial conceptual framework may not show all the relationships between concepts, as research progresses, the relationships become more apparent and can be developed into a final adapted conceptual framework, incorporating all the themes that emerged from the analysis.[6,10] Though the term ‘framework’ suggests that it must be a single coherent, integrated system of concepts, this is not always necessary or achieved for a conceptual framework to be helpful, and there are no fixed rules for constructing one.[9]

2.3 LOGIC MODELS FOR PROGRAMME EVALUATION

Durning and Hemmer describe programme evaluation as “understanding the programme through a routine, systematic, deliberate gathering of information to uncover and/or identify what contributes to the “success” of the programme and what actions need to be taken to address the findings of the evaluation process.”[11] Other

researchers refer to it as “the systematic collection of information about activities, characteristics, and outcomes of the programme to make judgements and improve the effectiveness and inform decisions about the future programming.”[12] Ultimately, programme evaluation involves systematically collecting information, identifying strengths and challenges, and using these to improve programme implementation.

Programme evaluation models are based on programme theories. Programme theories postulate how interventions contribute to intended outcomes.[13] Programme evaluations determine whether the intended changes occurred.[14] Logic models are used as programme evaluation models. Logic models based on theories of action focus on programmatic inputs and activities, while those based on theories of change focus on programmatic outcomes.[15] Logic models are based on linearity or reductionist theory. According to linearity theory, knowing the factors influencing programmatic outcomes can help explain why those outcomes are, or are not, achieved and flow logically from the inputs to the outcomes.[14]

Logic models provide concise graphical representations of the purpose, contents, sequence of activities, and outcomes expected from a programme.[16] They are causal models linking the inputs, activities or processes, outputs, outcomes and impacts,[17] as shown in Figure 2.1.

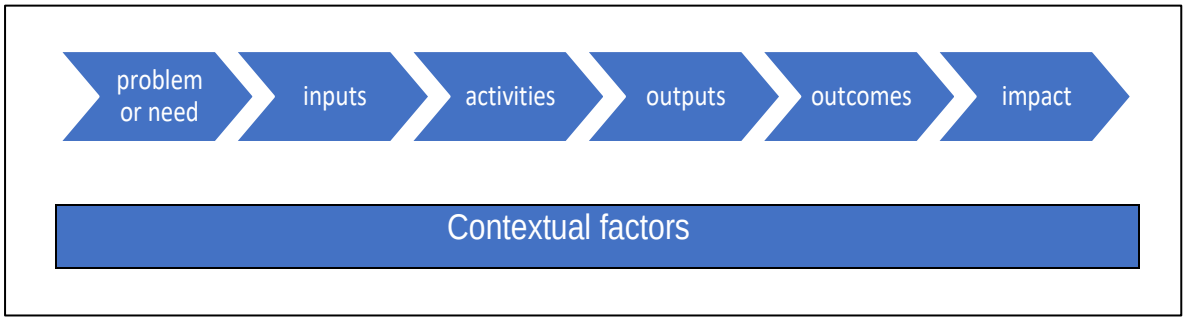

Figure 2.1: The basic components of a logic model[16]

Inputs are the resources needed for the programme. These include funding, facilities, faculty, equipment and support. The *activities* or *processes* are tactical actions to achieve the programme's objectives. The measurable products of the programme activities are *outputs,* and the *outcomes* are the benefits to the trainees during or after

training, which can be classified as short-term, intermediate or long-term.[16,18,19] *Impact* refers to long-term societal benefit.[17,20]

Logic models may be simple or complex.[19] Simple logic models evaluate specific programmatic aspects.[17] For example, the black-box model only evaluates inputs and outcomes.[15] Two-step models, called process-outcome models, evaluate programme activities, outputs, and mediators but have been criticised for overlooking key components and contextual factors such as resources, external influences and relationships.[13] Complex logic models evaluate the programme's components and their relationships to the context.[17] These logic models depict how multiple activities, intermediate outcomes, and parallel chains of mechanisms lead to expected outcomes.[15] The focus on the relationships between components makes complex logic models suitable for evaluating complex programmes.[21] Complex models may evaluate all the components or focus only on critical ones,[13] like resources and contextual factors.[22] Despite the advantages of complex over simple models, both have successfully been used to improve educational[23,24,25] and medical treatment programmes.[26]

Complex programmes are non-linear systems in which contextual factors and causal mechanisms influence the outcomes. Two of the four logic model approaches,[15] the standard *pipeline* and *outcomes chain,* do not comprehensively represent complex systems. Therefore, *realist matrices* and *narrative* approaches are often used to complement the standard approaches. *Realist matrices* consider the contextual factors influencing the overall outcomes. The *narrative approach* describes the programme's rationale for translating inputs into outputs and provides additional detail for those unfamiliar with logic model diagrams.[15]

Logic models cannot show all the activities and consequences of an intervention but focus on explicit and implicit goals, intended and unintended impacts, and external factors influencing the model.[15] The point of a logic model is to provide a coherent causal model of how an intervention contributes to results. Effective logic models focus on showing the sequential and consequential progression of essential elements. The purposeful use of arrows is essential to indicate the expected direction of change and improve readability.[15]

The level of certainty required in a programme evaluation influences which type of assessment (adequacy, plausibility, or probability) is used.[18] Adequacy assessments are cross-sectional, whereas plausibility assessments, quasi-experimental studies, and probability assessments are randomised controlled studies.[14,18] An adequacy assessment programme evaluation to determine whether essential components are present[14] was conducted in this study to gain ample descriptive data about the programme. Adequacy assessments focus on whether resources were used effectively, planned activities carried out, objectives met, and expected changes occurred without establishing any causal relationship between the programme activities and the changes.[18]

2.4 DEVELOPMENT OF THE LOGIC MODEL FOR THE STUDY

As discussed in Chapter 1, the FM postgraduate training programme of Wits University has been in place for more than ten years without in-depth pre- and post-implementation evaluation. This research aimed to evaluate the programme using a logic model as the conceptual framework, based on the assumption that good outputs and outcomes could be obtained if ideal inputs and adequate processes were in place.

Focusing on specific logic model components may cause significant changes within the programme,[15] thus selecting components with a higher potential to impact the programme meaningfully is critical. The complex programme evaluation logic model developed for this study (Figure 2.2) adapted some of the DCT-related factors from a scoping review conducted in an undergraduate medical education training programme in SA in 2017.[27] My prior knowledge and experiences and 'thought experiments' also influenced the selection of the concepts included in the logic model. Thought experiments enhance research creativity, making the researcher's experiential knowledge more explicit.[3]

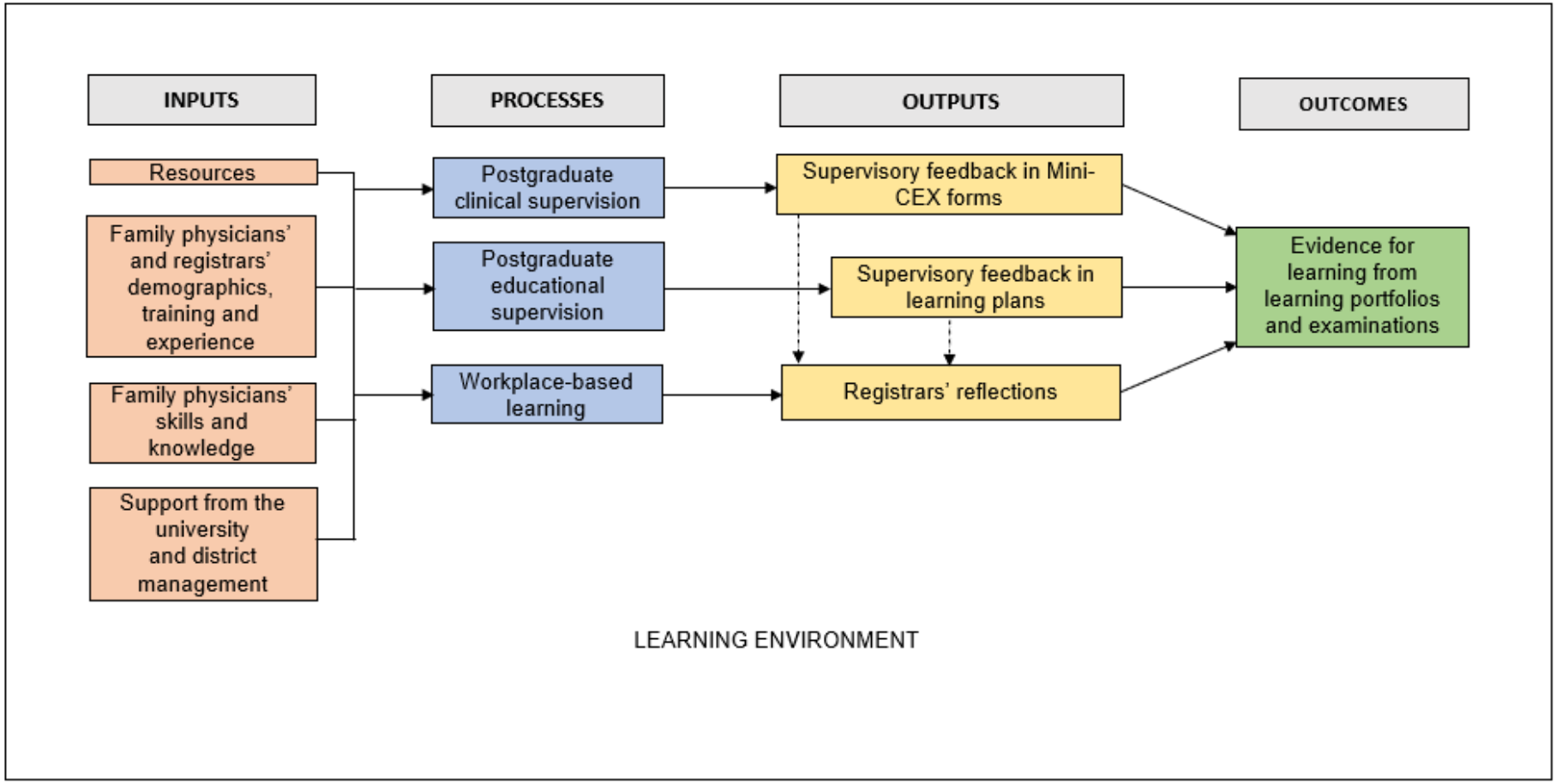

Figure 2.2: The logic model for the Wits University postgraduate family medicine programme evaluation

Logic models may consider several contextual factors. Based on the research questions and the focus on learning processes and outcomes, the learning environment was selected as the contextual factor for this model. The model uses the pipeline approach: it evaluates inputs, processes, output (theory of action) and evidence of learning as the short-term outcome (theory of change). The final, essential component of logic models is the long-term outcomes or impact. The distinction between the outcomes and the impacts is made in terms of the sequence where outcomes are the results of individuals while impacts are the results of a broader community or organization.[15] Although not evaluated in this study, the desired impact of this study would be better community-based health outcomes from the availability of better-trained family physicians.

Based on the assumption that ideal inputs and adequate processes could promote good outputs and outcomes, the following sections discuss the importance of the components and relationships included in the model.

2.4.1 Contextual factors: learning environment

The learning environment influences postgraduate supervision and trainees' learning. Organisational support from key stakeholders for trainers and trainees,[28] a conducive learning climate with adequate resources, and protected time for trainees' learning enhance the learning environment in clinical workplaces.[29,30] In contrast, heavy workloads,[31] time constraints, difficulties balancing work and personal life, and the absence of certain types of patients impede learning.[32] Other factors that negatively influence learning environments are unstable organisations with unclear management structures, a lack of teamwork and encouragement for developing trainees' work styles.[33] Human resource shortages among staff and trainers, work patterns and organisation of daily work negatively influence clinical environments.[28] The prioritisation of health service delivery leads to time constraints, and protected time for training and learning is needed.[28,31] Spencer *et al*. point out that time pressures, multiple responsibilities, increasing numbers of trainees, fewer patients, nonavailability of resources, and 'unfriendly teaching' environments are challenges in learning environments.[34] Despite these challenges, clinical environments are the only

setting where trainees can practice history taking and physical examinations and develop clinical reasoning, decision-making, empathy and professionalism in an integrated manner.[34] Hence, providing an optimal learning environment is critical in postgraduate training.

Learning environments are complex. Trainees and trainers feel valued and motivated by supportive leaders.[31,35] Trainees' learning beliefs influence the learning environment, and excessive patient workload interferes with trainees' opportunities to reflect, referring patients quickly to senior doctors to make decisions.[28] According to trainees, encouraging and committed supervisors with excellent teaching and mentoring skills, clear assessment procedures, and a supportive learning culture from hospital management for clinical teaching enhance the learning environment.[36]

2.4.2 Inputs

2.4.2.1 Material Resources

Postgraduate training programmes require adequate resources to meet training standards.[37] These resources include infrastructure with adequate space, lighting, comfortable seating arrangements, equipment, and sufficient skilled trainers.[30] Technological devices, equipment, infrastructure, and internet access are critical training components,[37] but severe shortages exist in decentralised settings.[38,39]

2.4.2.2 Family physicians' and registrars' demographics, training, and teaching experience of family physicians

Family physicians' backgrounds, training they received and teaching experience may influence how effectively they function as clinical trainers and supervisors, especially since most clinical trainers lack formal education for supervisory training.[40] In the absence of formal education for supervisory training, any previous training, including short courses and work experiences in the district health system, either as FPs or medical practitioners, could influence their teaching.[40] Training improves professional satisfaction, but trainers generally rely on their previous skills and experiences.[41]

Trainers reported feeling confident about sharing their knowledge and experience with trainees but less confident about whether their teaching aligned with the educational needs of the programme.[42] Peer feedback and peer observation enhance the trainer's teaching skills[43] but rarely occur in some training contexts.[44] Trainers require tools to support their teaching activities.[42]

2.4.2.3 Family physicians' skills and knowledge

Good clinical trainer and supervisor attributes extend across their roles as physicians and teachers and depend heavily on personal characteristics.[45,46,47] Physicians should have satisfactory clinical knowledge and skills, including clinical reasoning, display professionalism and foster good doctor-patient relationships.[45] They should value the patient as a whole, displaying the so-called 'soft skills' of empathy, respect, and compassion.[45,46] Effective teaching requires a passion for teaching, communicating the learning objectives, creating supportive learning environments, stimulating trainees' reflective practice, and committing to excellence.[40,45,46,47] Other good teaching strategies include being aware of trainees' needs, establishing good rapport and communication, providing constructive feedback, encouraging trainees to think critically, and making teaching relevant.[48] Effective communication with trainees involves listening attentively, questioning, and explaining difficulties.[34] Personal characteristics such as good interpersonal skills,[45,48] enthusiasm,[43,46] honesty,[40] competence,[47] compassion,[40,47] and empathy promote positive relationships and supportive learning environments.[46] Supervisors must also demonstrate good leadership skills for a suitable learning environment.[48,49]

The relationship between trainer and trainee is regarded as the most crucial element for adequate supervision.[43,50] Positive supervisory behaviours involve direct guidance on clinical work, linking theory and practice, engaging in joint problem-solving, and providing feedback.[40,50] Ineffective supervisory behaviours include failure to offer support, ignoring trainee concerns, and emphasising evaluation and negative traits.[51] Derogatory humour, trainers' descriptions of how hierarchy endures, the existence of gender issues, and senior staff criticising departments or institutions are examples of negative role modelling.[45] Among supervisor-trainee relationship attributes, the importance of knowing the trainee as an individual and trust, where supervisors have

confidence that trainees will seek help when needed, are essential.[43] Although the supervisor's role in supervisor-trainee relationships has been extensively researched in HICs, this does not extend to trainees' roles.[43] Both areas of supervisor-trainee relationships must be explored.

2.4.2.4 University and district management support

Sufficient organisational support from policy makers, such as provincial and district management and the university, is essential for successful DCT. The General Medical Council regulations in the UK specify that providing adequate resources and time for teaching trainees' is a shared responsibility of the higher authorities, such as chief executive officers and medical directors within an organisation.[50] In the UK, US, and Canada, training courses, resources, or toolkits are provided, supporting clinical trainers in their supervisory roles.[52,53,54,55] In contrast, in other settings, senior managers were often unaware of the impact of medical education on patient care, with trainers' and trainees' roles being undervalued and inadequate support for trainers[53] and trainees.[56] Thus, there is a varying level of support from higher authorities and the university among high[53] and LMICs.[37] The lack of leadership and understanding of the need to integrate a learning culture in the workplace can also act as barriers to adequate organisational support.[30,53] All members within an organisation require a mind shift towards a shared vision for medical education to achieve successful DCT.[30, 49,53]

Even in African settings, ongoing clinical trainer support from key organisational structures had various challenges. Family physicians perceived a lack of shared understanding of the discipline of FM by stakeholders, including doctors, specialists, and policymakers.[57] Although training improved academic vigour and job satisfaction, FP shortages, a lack of existing policies, and funding for training were challenges.[57] In an African study, the challenges were the external environment, resource constraints (staff and equipment), and the extent of district management support, which negatively influenced doctors working in a district health system.[58] Doctors played critical roles in the district, training students, interns, and junior doctors by mentoring and role-modelling but performing these tasks without much formal support and training.[58] Clinical educators perceived insufficient support from the university and

a need for more formal training, guidance, and clarity on what was expected during training.[41] Clinical trainer insights on organisational support of training in the district health system were critical, as this could influence multiple concepts within the framework. Hence, how district management and the university supported DCT was added as an essential concept to explore.

2.4.3 Processes

2.4.3.1 Postgraduate supervision

Supervision is a complex concept with multiple definitions, types and roles for supervisors.[56] Although there are many definitions of supervision, Burton and Launer define supervision in PHC as "facilitated learning in relation to live practical issues."[59] Adding to this, it is described by Kilminster as "the provision of guidance, monitoring and feedback on matters of personal, professional and educational development in the context of a trainee's experience of providing safe and appropriate patient care."[60] Supervision in one-on-one clinical encounters can occur as clinical and educational supervision, mentoring, preceptorship, and coaching, and the boundaries are often blurred.[56] Earlier theoretical models of supervision originated in nursing and other medical professions, but all supervision models emphasise approaches tailored to the trainee's experience level.[50]

The overarching goal of supervision is to acquire skills, knowledge and competencies while enhancing professional attitudes and skills and ensuring good patient experience and safety.[61] According to Launer, supervision can focus on trainees' development, performance or both.[56] However, since these areas overlap, the focus area depends on the context and supervisor-trainee relationship.[56] Supervision could take the form of didactic teaching versus encouraging reflective practice.[56] The interconnections between supervision, team discussion, and reflective practice are crucial in workplace-based learning.[62] Clinical trainer roles in supervision include roles as an information provider, allows on-the-job role modelling, and serves as a learning facilitator, mentor, and assessor.[63] Despite supervision being vital in medical education, it is the least investigated and developed aspect of clinical teaching.[64]

Clinical and educational supervision

Supervision occurs in clinical settings, including informal, clinical, educational, remedial, professional, and managerial supervision.[56] The most typical kind, clinical supervision, involves reflective case-based discussions and daily discussions on clinical management in wards or clinics.[65] According to Kilminster, a clinical supervisor's (CS) responsibilities include "providing a level of supervision necessary for the trainee's competence and experience and allowing them to perform tasks only when they are competent to do it."[64] Clinical supervision models include developmental, integrated, and orientation-specific models. In the developmental model, the clinical supervisor assesses, monitors and facilitates trainees' self-awareness, autonomy, and motivation as they progress.[65] The 'integrated model' requires the supervisor to function as a teacher, counsellor, and consultant, depending on the situational needs. The 'orientation-specific model' allows for creating situations to test the learners and debrief or provide educational supervision, ensuring trainees' clinical and educational progress.[64]

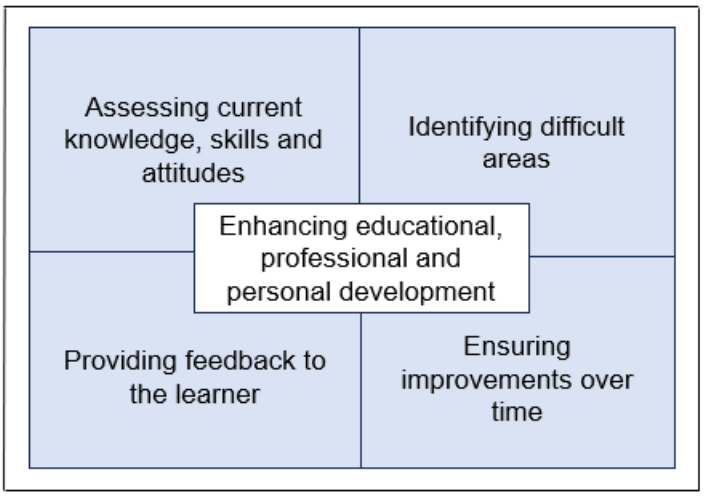

Figure 2.3: Elements of good educational supervision (Source: Growley *et al*.[66])

The essential qualities of an educational supervisor (ES) include developing a good trainee relationship, being a good listener, assessing current knowledge, skills, and attitudes, ensuring professional, personal, and educational progress, providing feedback and ensuring improvements over time by the trainee (see Figure 2.3).[66]

Educational supervisors develop a learning agreement with the trainee, supervise them to develop and maintain learning portfolios and regularly review the learning opportunities.[64] The primary responsibility of the educational supervisor is to motivate and encourage the trainee to become the best version of themselves.[61]

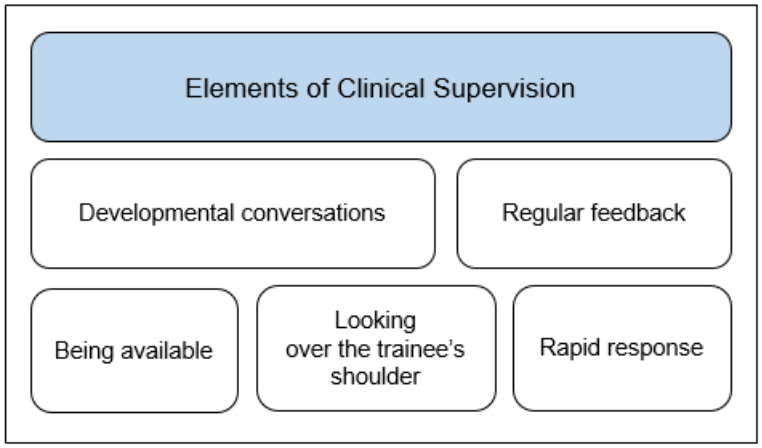

Figure 2.4: Elements of good clinical supervision (Source: Kumar *et al*.)[65]

The main difference between CS and ES is that CS supervise and develop trainees for a four to 12-month placement. ES provides assessment and feedback throughout the three-year training programme.[66] Both supervisory roles require sound feedback skills: ES provide feedback on trainees' progress, and CS should give feedback on trainees' clinical competence and conduct competence assessments [64] (Figure 2.4). Although it is recommended that the ES and the CS not be the same person throughout training, prior research has shown that this is not always the case, even in HICs postgraduate training.[66,67]

High-quality supervision is vital for the trainee development at any stage of the training pathway.[61] Good quality supervision involves normative supervision (ensuring the trainee provides quality patient care), formative supervision (offering timely feedback), and restorative supervision (attending to trainees' well-being).[61]

Trainees need different types of supervision according to their level of competence. The different kinds of supervision are direct (being present in the same room), immediately available (being in close proximity to assist), local (being available at short notice in the primary care or the hospital premises) and distant supervision

(being on call for advice).[60] Adequate supervision is essential when learning new skills, and excessive work commitments must not jeopardise trainee safety. Kilminster *et al*. proposed the following features for effective clinical supervision:[60]

- Direct supervision - supervisor and trainee working together and observing each other promotes trainee development and patient outcomes.
- Constructive feedback - is essential and should be frequent.
- Supervision should be structured, including regular tabled meetings with trainees. The content of meetings should be agreed upon, and learning objectives must be determined before the start of the supervisory relationship. Supervision contracts can be valuable tools and should specify the frequency, duration and content of supervision, learning objectives, assessments and other requirements.
- Supervision should include clinical management, administration, teaching and research, pastoral care, interpersonal skills, reflection, and personal development.
- Supervisors must have good interpersonal and teaching skills and be clinically competent and knowledgeable.
- A 360-degree perspective and evaluation should inform the supervisory process.

Supervision and training in the workplace involve informal training opportunities. In a realist synthesis, exploring informal training opportunities in postgraduate training characterised underpinning pairs of mechanisms, such as supervised participation in practice, which includes ‘entrustment’ and ‘support-seeking,’ mutual observation of practice, which involves monitoring and modelling and dialogue during practice comprising ‘meaning-making’ and ‘feedback.’[51] Entrustment refers to how much trainees can be trusted with increasingly complex tasks, whereas support-seeking is when the trainee gets input on patient care from a senior doctor.[51] Mutual observation occurs when supervisor and trainee work alongside, whereas ‘modelling’ integrates senior doctors’ practices into theirs.[51] Informal training opportunities were explored in HICs to some extent but are still inadequate in LMICs.

Spencer *et al*. specify that the barriers to supervision in clinical settings were time constraints, an increased number of trainees at various levels, poor incentives, an unsuitable clinical environment, handling multiple roles and responsibilities, and teaching opportunistically.[34] Ineffective supervision includes challenges in contacting clinical supervisors, poor teamwork, expecting trainees to perform procedures outside their competence and inappropriate behaviour.[61] Additional challenges were a lack of clear objectives, a focus on factual recall rather than developing problem-solving skills, inadequate opportunities for reflection, and a lack of supervision and feedback.[34] Subramani *et al*. explained that challenges in outpatient settings were due to busy settings,[43] time constraints, brief trainee-trainer interactions, concurrent service and learning, and patient care taking precedence.[40] Barriers in inpatient settings were difficulties setting goals as teaching happens spontaneously, supervisors' tendency to lecture instead of interactive practical sessions, and trainees' reluctance to admit mistakes in the presence of staff or patients.[40] How postgraduate supervision is delivered in sub-Saharan decentralised clinical settings, especially in facilities like clinics and hospitals, needs further exploration.

2.4.3.2 Workplace-based learning

Various learning theories and factors influence workplace-based learning (WBL). WBL comprises primarily informal but includes formal training opportunities. Formal training is characterised by a defined curriculum, timetables, and progression. In contrast, informal training is not well organised, occurs opportunistically and is criticised for lacking educational rigour, process, and structure.[68] According to Eraut, “typologies of informal learning that occur in the workplace” were characterised into “implicit, reactive, and deliberative learning.” In implicit learning, there is an implicit link between memories and current experiences, and some of these experiences enter the episodic memory, causing unconscious expectations.[69] Reactive learning involves a brief, near-spontaneous reflection on past episodes or experiences, recognising possible learning opportunities.[69] Deliberative learning happens when reviewing experiences and engaging in decision-making, planned informal learning, and future learning opportunities.[69]

Among various learning theories, the most prominent are behavioural theories, broadly classified as individualistic (psychological or cognitive) and social constructivist approaches,[40] which apply to WBL. Cognitive, socio-cognitive, and constructivist learning occurs when existing and new knowledge interact.[34] Various cognitive theories are experiential, psychological, and self-determination theories and are internally mediated by the trainee's engagement with experiences and the construction of new knowledge.[40,68] However, these theories do not include the trainer roles. The psychological theories include learning and memory theories, which have many knowledge and skills acquisition models, including the conscious-competence model.[40] While cognitive theories focus on trainees' learning from their own experiences and self-reflective processes, socio-cognitive and social-constructivist theories highlight learning from social interactions and trainee engagements with the trainers.[68] The socio-constructive theories incorporate situated learning and participation in communities of practice. Situated learning is an example of learning by participation in a community of practice with other trainees or more senior or experienced individuals.[70] Morris *et al*. detailed how socio-cognitive theories facilitate the development of trainees at workplaces:[68]

- Focus on the development of individual trainees.
- Consider the trainees' learning needs, potential, and self-efficacy.
- See experience as the basis for learning.
- Foreground reflective practice.
- Value vicarious learning by observation and modelling.
- Offer strategies to maximise learning by a cognitive apprenticeship.
- Acknowledge the assistance of more knowledgeable individuals, including peers.
- Signal the importance of the tools used to mediate the learning from conceptual to physical.

A scoping review (2020) conducted in SA examined how trainers facilitated WBL in various health science disciplines and highlighted the need for additional research on trainees' learning.[71] Only a few articles in the review mentioned learning theories, most commonly experiential and situated learning. Other theories used were transformative

learning, reflective models, cognitive, adult and behavioural learning. Most of the studies included in this review were from HICs, leaving a gap to explore how these theories were applied in WBL in other countries, especially in African settings.

Learning behaviour

Self-regulated and self-directed learning behaviour are essential components of informal WBL. Self-regulated learning depends on trainees' cognitive function in an academic setting. Self-directed learning occurs when they want to know more about topics of interest and occurs mainly in experiential settings.[72] When trainees see actual patients in natural settings, they are more likely to develop soft skills such as communication, professionalism, and clinical reasoning. Supervisors must create sufficient structured opportunities for trainee self-reflection, which is integral to self-directed learning.[73] Affective skills are fundamental to self-directed learning and becoming a life-long learner, although there is a lack of literature on objectively assessing these skills.[72]

Among trainee factors, trainees' accountability, active involvement, autonomy, professionalism, confidence, conscientiousness, and ability to accept criticisms positively contributed to learning.[74] A study among postgraduate GP trainees in the Netherlands explored how trainees regulate their learning in the workplace. While trainees' self-motivation acted as an enabler, lack of concentration, problems dealing with negative feedback, and being a passive learner with a lack of motivation for self-driven learning were disablers.[32] Trainees' ability to seek support varied depending on the context and relied on supervisor availability and trainees' readiness to seek help from seniors.[75] Learning at the workplace is trainee-driven, taking ownership of their learning on what and how to learn, developing personal learning outcomes, engaging with formal and informal learning opportunities, and regular reflection on whether goals are achieved.[76]

Self-regulated learning involves short and long learning loops.[32] Short loops occur during consultations when trainees lack the knowledge to manage minor ailments or perform procedures, usually involving simple tasks based on recall or patient records. They engage supervisors or address learning gaps by accessing the Internet or

handbooks. Long loop learning happens during complex tasks with multiple activities, getting feedback from supervisors, mentors, or peers, searching the Internet or books, and identifying them as part of external assessment and more likely to be included in the LP.[32] Short and long loops resembled Eraut's reactive and deliberate learning theories.[69]

Learning opportunities

In WBL, interpersonal interactions with supervisors, patients and other professionals and contextual factors influence trainees' learning opportunities.

Some interpersonal factors enhancing WBL are engagement and willingness to obtain feedback from supervisors, mentors, or peers and supervisors' commitment to trainees' learning.[74] The lack of a supervisory relationship or supervision negatively impacted WBL.[32] Other enhancing factors are inspirational leadership, team commitment to teaching and learning, good team dynamics, and maintaining the relationship between trainers and clinical staff.[77] Factors such as social integration, engagement with good supervisors, and a good workplace with privacy and access to the Internet and library promote WBL.[33] Interactive teachers and high-quality teaching, gaining hands-on experience by performing skills,[78] having direct patient interactions, are positive experiences. In contrast, poor quality teaching, limited time and poor organisation were negative experiences.[78] Other challenges were lack of appropriate skills among teaching staff, lack of role modelling opportunities, and service commitments.[31] Regarding reflection on action, peers contributed more than supervisors, as supervisor presence was perceived as a less safe environment.[79] Time for reflection, encouraging trainees to share ideas with peers and supervisors, and providing a safe and supportive learning environment creates self-directed learning opportunities.[79] Comparing WBL opportunities identified by supervisors and trainees, supervisors recognised engaging with trainees, role modelling, trainee characteristics, and trainees' reflection on their experiences as essential factors, which trainees did not identify.[33]

Work-based learning occurs more informally than formally while discussing patient uncertainties with supervisors, who act as facilitators.[31] When the supervisor provides feedback, creates a safe environment, demonstrates good supervisor-trainee

relationships and characteristics, and provides opportunities for supervision, mutual observation and dialogue, all of these act as enablers for trainees' WBL.[51] Thus, the learning process involves full integration into the community where the trainee practices and engages with supervisors and peers.[76] Welink *et al*. (2020) described how trainers checked trainees' behaviours, actions, and decision-making in patient consultations and helped them to apply their knowledge during informal workplace conversations.[80] Trainers listened to trainees' up-to-date knowledge, searched for more evidence, and identified their gaps, enhancing the bidirectional learning of trainees and trainers.[80]

Interactions with the same or other professionals influence WBL. WBL occurs within or between different professions (doctors, nurses, physiotherapists, occupational therapists, and other health professionals) by collaboration.[81,82] From the trainee's perspective, confidence, recognition of others as experts in their rights, openness about uncertainties, awareness of one's own learning needs and goals, and facilitating others' learning are motivators to learn from other professions.[83] Team member relationships and a sense of shared responsibility accelerated learning from other professionals.[83] Trainees learning from the same professions are enhanced if they are made more intentional.[84] Multiple personal and interpersonal factors, including perceptions of relevance, awareness of learning, trainee and trainer roles and interpersonal relationships, could influence learning from the same professionals.[84]

Workplace-based learning opportunities include primary and secondary learning opportunities.[77] Primary opportunities such as workshops, working under supervision, shadowing other staff, and e-learning facilitate trainee learning. Secondary learning opportunities occur as a secondary outcome while performing another task, such as discussions with colleagues during ward rounds or meetings, modelling, ad-hoc discussions, and debriefs.[77] Learning opportunities arose from planned and unplanned situations to meet competency levels based on trainee learning goals during reflections and when exposed to situations stretching their boundaries.[85] Trainees learnt from 'apprenticeship learning' while working alongside a senior doctor and informally from participation in practice.[28] Trainees perceived themselves more as service providers than learners. They felt they were interrupting the trainer's work,

minimising engagements, while for trainers, trainees' participation in practice equated to learning, and trainees were not using them enough for learning.[28]

Most importantly, WBL occurs during trainee-patient encounters, forcing them to learn by reading around patient presentations.[32,78] Learning opportunities evolve from active patient engagement, taking time for patient presentations and viewing each encounter with an interrogative approach to concepts needing clarity.[76] During patient interactions, trainees identified their deficiencies in medical competencies but did not identify a lack of general competencies, such as skills in communication and ethics.[79] Picking up patient cues during communications provides informal feedback to modify patient communication skills and develop lifelong learning behaviours.[86] Stok-Koch *et al*. specify that learning occurs during multiple interactions with patients and their families, supervisors, other experienced doctors, nursing staff, and interdisciplinary team members.[33]

Trainee WBL motivators and barriers were explored in a few studies in the SA context. Bezuidenhout *et al*. studied postgraduate integrated learning experiences, grouping them as alienating and engaging. These factors were influenced at various levels: university, workplace, home circumstances, and individual factors.[87] Motivating factors were trainees' ability to teach undergraduate students, attend conferences and workshops, feel empowered and respected as trainees, display a positive attitude to WBL, demonstrate academic role model behaviour and have supportive trainers. Barriers were trainees' feelings of insecurity and lack of motivation, registrars' lack of openness to discussion or initiative, negative supervisor feedback, and a conflict between family and work responsibilities.

Trainers with good organisational skills and professionalism aided learning.[88] Registrars internalised a biopsychosocial approach during patient interactions while heavy clinical and academic workloads hampered learning.[88] Supervisors' learning or teaching style, learning conversations in the clinical context, ways of providing feedback, and role modelling opportunities affected trainees' learning at the workplace.[89] Although the above studies looked briefly into some of the factors influencing WBL, and one study investigated trainees' perceptions of working in a

laboratory setting in various hospitals, an in-depth exploration of factors affecting WBL in the district health system in SA is still lacking. It is, hence, included within the framework.

2.4.4 Outputs

2.4.4.1 Feedback

Feedback is a vital aspect of supervision in clinical settings with specific characteristics.[90,91,92] Since the 1960s, researchers have attempted to define feedback components and continually reviewed terms and definitions.[93] "Feedback intervention is an action by an external agent to provide information regarding aspects of one's task performance."[94] Feedback should be specific and targeted at trainees' learning goals. [90,95] Feedback provides insight for trainees into what was done well or poorly and the consequences of their actions.[40] Although there are a variety of feedback models, they all explore trainees' self-assessment, offer suggestions on areas to improve and develop an action plan.[96] Feedback, when done well, promotes trainees' self-reflection, developing them as self-directed lifelong learners.[40] In a WBL context, a newer term for feedback is 'performance-related information,' which encompasses the trainee's perspectives rather than supervisors ensuring a non-judgemental approach.[97] Positive feedback builds the trainee's self-esteem, and constructive or negative feedback ensures good patient care.[34]

In clinical encounters, feedback is often insufficient in providing honest and meaningful information.[95,98,99] Poor feedback focuses on personal attributes and mannerisms rather than actual performance.[100] Lack of external supervisory feedback causes trainees to overrate their performance.[99] Unhelpful feedback is not exploring trainees' thoughts or feelings, providing little feedback, and being judgmental. Helpful feedback fosters a respectful, friendly learning environment.[96] Omitting feedback or reducing supervisor feedback quality has adverse consequences, even compromising patient care.[40]

Weallans *et al*. provided a composite guidance for supervisors on how to provide effective clinical supervision feedback.[96] Establishing rapport and maintaining an educational alliance with the trainees are pertinent.[96] Feedback should be individualised for the trainee's benefit with a flexible approach.[96,99] The emphasis is on trainee-trainer interactions, allowing clarification and actively exploring trainees' views, understanding, and emotions.[73] The supervisor and trainee's agreement on specific written action plans and how to achieve them are most important.[26,96]

Educating supervisors and trainees on feedback characteristics is essential for providing effective feedback.[90,99,101] Studies identified training needs for supervisors and trainees on the accuracy of feedback on trainees' performance.[95,102,103] Holmboe *et al*. proved that short educational interventions could improve feedback provided by supervisors.[104] Trainees also required a clear understanding of assessment standards and good self-reflective skills to translate feedback into an action plan.[100]

Feedback in the mini-CEX tool

The mini-clinical evaluation exercise tool (mini-CEX),[105] developed by Norcini *et al*. in 1995 and modified by the American Board of Internal Medicine, is used to assess history taking, physical examination, clinical judgement, professionalism, and synthesis in various settings.[106] One of the most commonly used WPBA tools, the mini-CEX, was modified to accommodate multiple competencies, such as organisational efficiency and counselling, for its adaptability to various settings.[95,106,107] The educational impact of the mini-CEX tool has been investigated in HICs like Europe, New Zealand and Australia, with fewer studies in Asia and Africa.[100,106,107,108] Although the mini-CEX has good content, construct, criterion validity, acceptability, and reliability with good educational impact,[106,109] its use depends on supervisor-trainee-tool-context characteristics.[100,110]

Several challenges and strengths exist when providing feedback using the mini-CEX tool. Although giving structured feedback is one of its primary goals, supervisors often focus more on the trainee's observed performance and give insufficient feedback.[95,108] Supervisors either failed to recognise feedback as a teaching tool or lacked the expertise to provide effective feedback. Clinical supervisors tended to give high scores not aligning with trainee-observed performance during assessments.[111] This could be

due to supervisor skills deficiencies or inadequate space provided for written narrative feedback in mini-CEX forms.[95] In WPBAs, trainees value narrative feedback more than numerical scores. Written feedback on a trainee's strengths and weaknesses helps trainees reflect and understand what constitutes good performance and develop action plans.[102,112]

Evaluating feedback areas and scores in mini-CEX assessments illustrated various strengths and challenges.[106,108,113] When scores and supervisor feedback from mini-CEX forms were compared, it was found that, while scores on competencies increased with years of training, the quality of the feedback was still inadequate.[106] Feedback was mainly given on areas that had been done well, less on areas that needed improvement and least on written action plans.[108,113,114,115] The content analysis on feedback focused on clinical skills and knowledge but not professionalism, communication skills or reflective skills.[116] Trainee feedback focused on improving medical interviewing, physical examination, and counselling skills across various specialities.[108] Feedback provided most times were global judgments, lacked specificity on the learning gap and was often based on hearsay.[114,115] Supervisory feedback often fell into the 'non-specific' or 'moderately specific' categories rather than the 'specific' category.[115,117]

Feedback on learning plans

Individualised learning plans are the most effective educational tools that trainees develop to achieve learning goals aligned to speciality outcomes.[118] In self-directed learning, trainees establish goals and identify activities and resources to achieve them[72] by facilitation by educational supervisors.[119] The goals developed should fit the SMART model to achieve the trainees' goals in learning plans; they should be critical, specific, measurable, accountable, and have realistic timelines.[120] Supervisors' vital role in trainees' self-directed learning is to create a learning culture by viewing feedback and reflection as active learning behaviours.[121] Although trainees' internal feedback influences self-directed learning, it depends primarily on supervisory feedback.[73] The trainees either augment, agree or disagree with task interpretation and actively engage with feedback to effect learning outcomes. Supervisors should guide trainees on expected performance and agree on action plans to achieve goals. Future supervisor-trainee discussions should link to the progress of the action plan

and future performance, thus empowering self-directed learning.[122] Trainees can learn these essential skills for self-directed learning when the supervisor models goal setting.[123]

Seven principles of good supervisor feedback to facilitate trainees' learning by self-regulation are shown in Figure 2.4.[73]

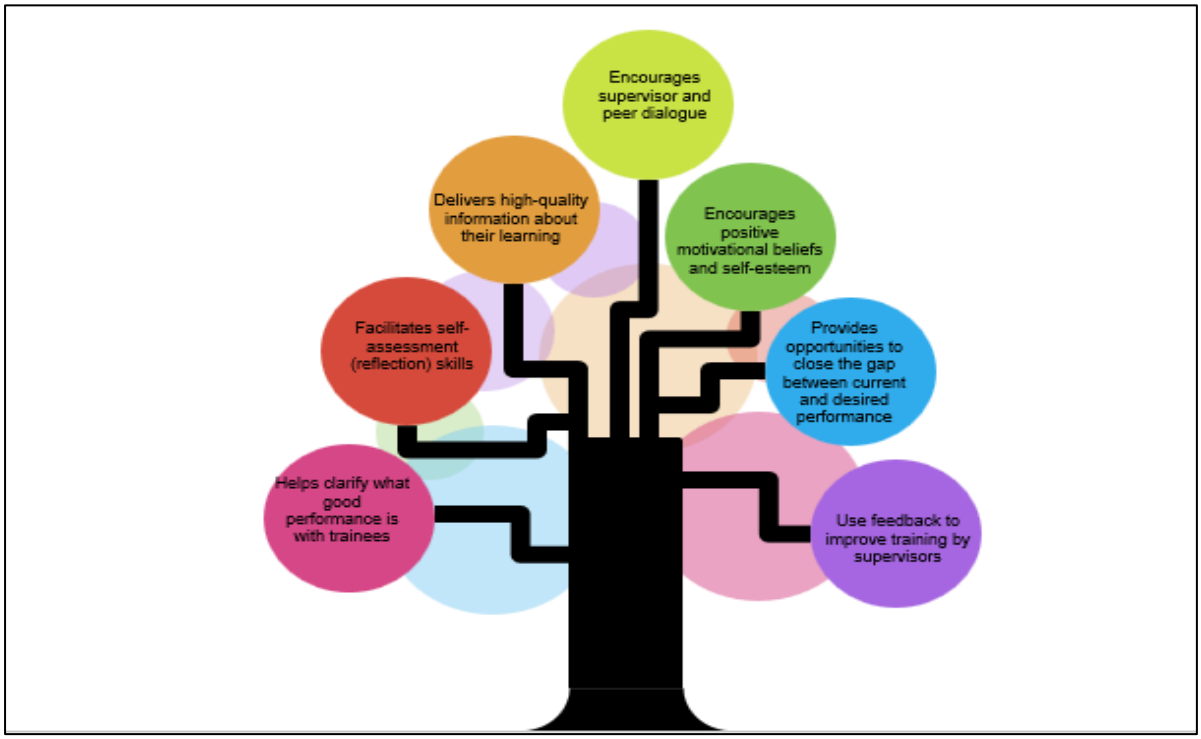

Figure 2.4: Good supervisor feedback practices to facilitate self-regulation (adapted from Nicol and Macfarlane[73])

Significant differences in supervisor and trainee understanding of learning goals and assessment standards necessitate adequate feedback.[73] When the learning plans of medical students were evaluated, feedback related to the learning goals was only provided when written on top of the learning plans.[124] Similarly, when learning plan use for self-directed learning was evaluated, medical knowledge was the most frequent and professionalism the least frequently identified goal.[125] Trainees and supervisors revealed mixed perceptions on using the learning plan; some felt that trainees used it like a tick-box exercise, whereas others recognised it as an excellent tool for promoting self-directed learning.[126] Interestingly, supervisor engagement in the learning plan was infrequent, and trainees used it better when supervisors engaged.[126]

While the feedback characteristics varied immensely across various settings and most studies were conducted in HICs, how it occurred within the decentralised district health system of LMICs was inadequate, with identified gaps in the literature. Consequently, it was decided to include this critical concept, facilitating self-directed learning, as the output evaluated in the framework.

2.4.4.2 Reflection

Multiple definitions of reflection emphasise purposeful critical analysis of knowledge and experience to achieve deeper meaning and understanding.[127] Boud *et al*. define reflection in the context of learning "as a generic term for those intellectual and affective activities in which individuals engage to explore their experiences to lead to new understandings and appreciations."[128] In a similar term coined by Schon, known as 'reflective practitioner,' reflection is used to learn from experience, especially when faced with complexity or uncertainty in professional practice.[129] Various types of reflection include superficial and deep strategies such as reflection-in-action and reflection-on-action.[127] Various models and levels of reflection exist, and the process of reflection can be multifactorial, varying across individuals and contexts.[127] In this study, although we have not evaluated reflection in-depth as a concept, the logic model assumes that registrar learning is supported by reflective behaviours when facilitated by supervisory feedback, which supports self-directed learning.

2.4.5 Outcomes: Evidence for learning

Assessment practices in medical education focused in the earlier years on various levels of Miller's pyramid as 'knows' (testing factual recall of knowledge), 'knows how' (applying knowledge to problem-solving) and 'shows how' (clinical practices using traditional long or short cases), but were still deficient in assessing trainees' habitual practices in their workplace as evidence for learning.[130] There was greater emphasis on testing knowledge alone in medical education but not enough on skills and attitudes and their integration.[131] Evidence for learning is best evaluated by simultaneously assessing the knowledge, skills, and attitudes and trainees' ability to integrate them into observable competencies.[131] The evidence of learning at lower levels of Miller's

pyramid was evaluated by multiple-choice questions, objective structured clinical examinations and simulated patients, and oral examinations.[130] Assessment practices in competency-based medical education in recent years shifted their focus to the 'does' component at the apex of Miller's pyramid, assessing trainees' performance for comprehensiveness and authenticity,[130] while improving patient care and safety in clinical settings.[132] In this study, I looked at the evidence for learning in WPBAs conducted at DCT sites that best represent registrar practices in authentic settings.

Competency-based medical education is an outcome-based approach to designing, implementing, assessing, and evaluating medical education programmes using an organised framework of competencies.[131] Various assessment methods were introduced as part of competency-based medical education, focusing on the apex of Miller's pyramid, and non-standardised assessments using WPBA tools have become integral in workplace assessments.[133] These WPBAs are valid and reliable when multiple assessments by different assessors are done in various contexts.[100,132,133]

Workplace-based assessments are essential for formative (AfL) and summative (AoL) assessments. Formative WPBAs or AfL provide feedback focusing on the learning and development of trainees. In contrast, the aggregation of multiple assessments provides a rich picture of competency development to make a final decision on their progress (AoL).[133] Assessment for learning, a critical element of competency-based medical education, relies on multiple assessment methods by multiple assessors with the provision of sufficient formative feedback.[132] Assessment for learning is part of everyday practice by trainees, teachers and peers that seek, reflect and respond to information from dialogue, demonstration, and observation in ways that augment ongoing learning.[134] In AfL, the primary focus is on the trainee, and educational benefit is about the change and growth occurring during the entire scope of the assessment experience.[135] The use of WPBAs to develop competencies and a collective decision-making process for certification are essential components of AfL.[107] Compared to AfL, AoL is conducted for accountability, ranking, and certification of trainees' achievement of competence.[136] The debate whether WPBAs should be used for AfL, AoL, or both is ongoing in medical education.[100,107]

Workplace-based assessments are essential components of programmatic assessments.[137] In programmatic assessments, each activity is a data point about the trainees' performance on various competencies, providing feedback, and multiple data points are longitudinally collated to make summative decisions on trainees' progression.[137] van der Vleuten *et al*. stated multiple factors that influence successful assessment strategy in the programmatic assessment model.[138] Some critical factors are the triangulation of multiple data sources to make final trainee decisions instead of relying on single data points, using qualitative narrative information with quantitative data, integrating trainee viewpoints in assessments, incorporating adequate feedback or feedback cycles, sampling across different contexts and patients, multiple trainers and establishing assessment committees to discuss inconsistencies in assessment data sets.[132,138]

There are gaps in exploring how WPBAs are conducted in FM training, especially in a public district health system in LMIC settings. The Wits programmatic assessment model introduced in FM training had multiple strengths and challenges that need further exploration to strengthen the current programme. For these reasons, I decided to include the formative and summative WPBAs in the logic model used in this study.

2.5 CONCLUSION

This chapter described the development of the complex programme evaluation logic model used in this study and discussed the rationale for selecting the concepts included in the model. The next chapter, Chapter 3, describes the research design and study methods.

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CHAPTER 3. RESEARCH DESIGN AND METHODS

3.

3.1. INTRODUCTION

The early sections of this chapter discuss the research goals, philosophical assumptions, paradigms, and study design for this study. The following sections provide the rationale for adopting a case-study approach and discuss the sampling, data collection and analysis techniques. The ethical considerations for the study, limitations, and measures adopted to improve research rigour are then discussed.

3.2. RESEARCH GOALS

Research interests originate from a researcher's personal interests, professional commitments and concerns, and recurring social challenges.[1] According to Strauss and Corbin,

> *"Choosing a research problem through the professional or personal experience route may seem more hazardous through the suggested [by faculty] or literature routes. This is not necessarily true. The touchstone of your own experience may be a more valuable indicator of a potentially successful research endeavour."* [2]

Research goals can be classified into personal, practical, and intellectual categories.[3] Personal goals develop from researchers' motivation and experiences.[3] Practical goals focus on engendering change; intellectual goals allow insight into what is happening and why.[3] My personal, practical, and intellectual goals influenced my research goals for this study. Having observed the strengths and challenges in the Wits DCT programme for more than ten years, the study originated from my interest and passion and "thought experiments"[3] on how the programme could be improved. While working in primary health care settings, I was interested in the successes and numerous difficulties encountered in the training programme at several sites. I felt compelled to explore the motivators and barriers in implementing the programme. I believe that incorporating solutions to the existing challenges, which are grounded in

the context of the district health system, would aid in creating optimal decentralised district training complexes.

3.3. RESEARCH STRATEGY

Researchers should have a research strategy or research approach related to their research paradigm.[4] This strategy involves the philosophical assumptions underpinning their research, the research design, data collection and analysis methods.[4] Denzin and Lincoln described this strategy as a "strategy of enquiry", which involves the "skills, assumptions, enactments, and material practices that researchers use when they move from paradigm and research design to the collection of empirical materials."[5] Research approaches are categorised into quantitative, qualitative and mixed methods, which combines qualitative and quantitative methods.[4,6]

3.4. RESEARCH DESIGN

A research design provides "a plan with a logical sequence that links the research questions on how the evidence can be collected and analysed to achieve the final results or conclusions."[7] This plan organises the research to answer the research questions,[8] and is tailored to fit a research purpose with specific study methodology and methods.[9] Methodology refers to the underpinning principles that guide the research, justifying the methods chosen.[10] In contrast, study methods detail how the research steps, including data collection and analysis, are conducted and logical interpretations drawn.[11]

Figure 3.1 explains the research design for the study. It highlights how qualitative and quantitative data collection and analysis methods were used to answer the research questions guiding this study.

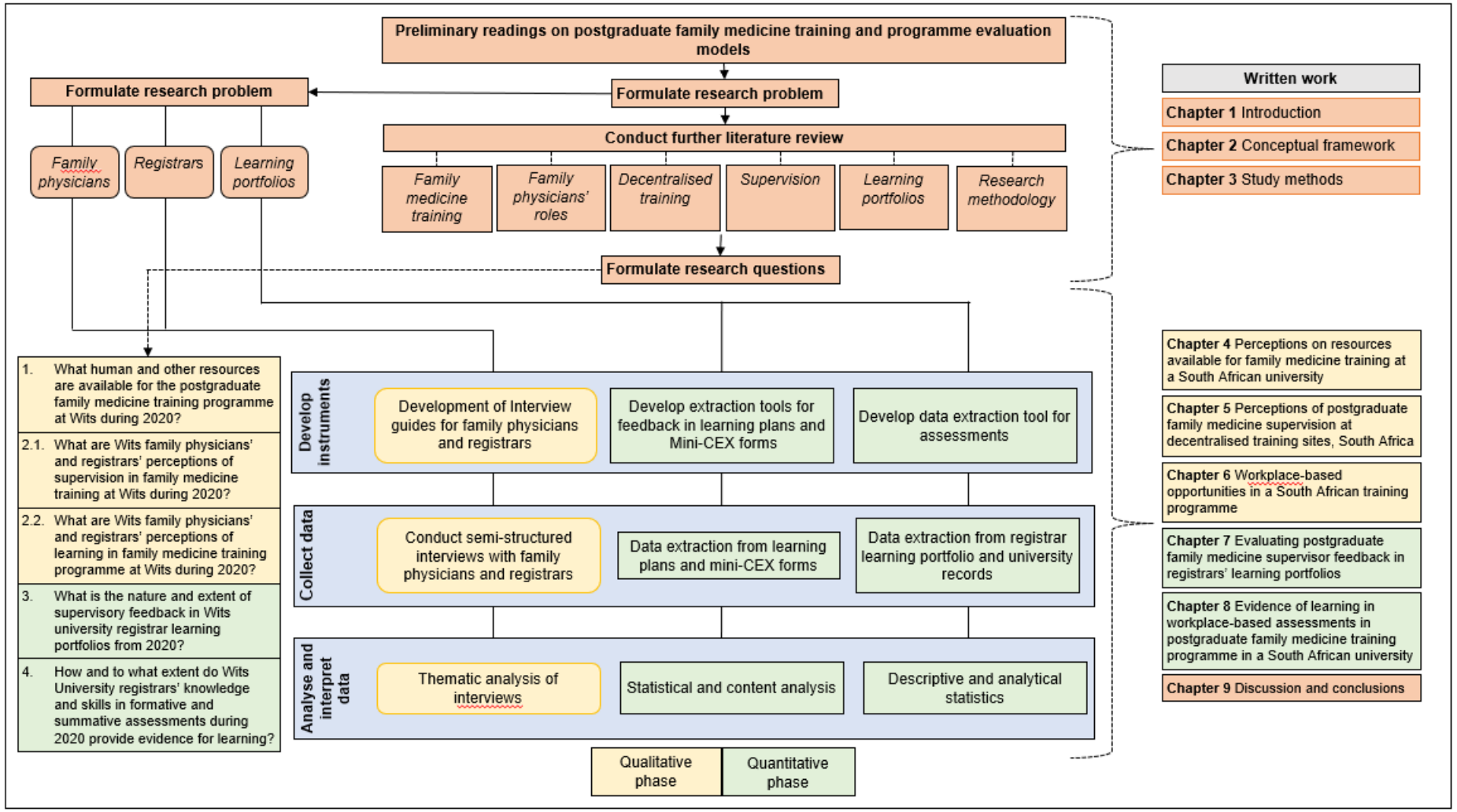

Figure 3.1: Research design

3.5. PHILOSOPHICAL ASSUMPTIONS

Researchers should clarify the philosophical assumptions guiding their research. Ontology is a branch of philosophy concerned with “issues of existence or being as such” or questions on the “nature of reality”[12] that researchers assume when conducting research.[13] Ontology is linked to epistemology, which refers to how researchers acquire knowledge of what they want to know or investigate[11] or “what is the relationship of the knower (researcher) to the known (what is investigated).”[14]

Philosophical assumptions originated in social science literature and primarily have two contrasting ontological and epistemological perspectives: realist or positivist and relativist or subjectivist. Positivists believe in a single reality where “the knower and the known are independent.”[12,14] In the subjectivist or relativist perspective, “the existence of the world is interpreted in different ways by different people and favours viewing the world as more personal and humanly created.”[14]

3.6. RESEARCH PARADIGMS

One’s ontology influences epistemology, which, along with one’s paradigm, informs methodological choices, guiding the selection of appropriate research methods.[10,11] Multiple definitions and interpretations of the term paradigm exist in the literature, requiring that this term be explained before describing why a specific paradigm was chosen for this research. “A paradigm is a theoretical framework comprising the set of basic beliefs that guide the research or practice of a scientific community that influence the way knowledge is studied and interpreted within a discipline.”[15,16] Lincoln and Guba describe paradigm as “what we think about the world and our actions, a general perspective or a systematic set of beliefs together with their accompanying methods.”[14] Patton called it “a world view, which is a way of making sense of the complexities of the real world which tells us what is legitimate, important and reasonable.”[17] Kuhn defines a paradigm “as a set of generalisations, beliefs, and values of a community of specialists or scholars” or “a way of looking at the research phenomena.”[18]

The earliest paradigm, positivism, was characterised by an extremely positive evaluation of science and scientific methods.[14] Positivists were critiqued for ignoring aspects of humanness, inability to deal with emergent conceptual formulations, and excessive dependence on operationalism.[14] As a result, positivism was eventually superseded by postpositivism, which acknowledges the influence of complex human behaviour, individual motivation, and the cultural environment when searching for reality.[11,10] In this paradigm, researchers make claims of knowledge based on cause-effect thinking, focusing on selected variables and attempting to interrelate, detailing observations and measurements, and testing and refining theories.[4,19]

The absolute scientific objectivity required of postpositivists versus the importance of subjectivity in social science research led to paradigm debates.[17] This debate refers to the conflict between positivism and constructivism on philosophical and methodological issues[20] and focuses on the differences between the two orientations.[21] Kuhn declared the different paradigms incompatible,[18] contributing to the evolved paradigm debates.[20] Other researchers neglected the dichotomy of postpositivism and constructivism. They had belief systems based on practical applied philosophy to guide methodological choices,[11,22] which allowed the evolution of newer paradigms such as pragmatism.

Pragmatism is a more recent paradigm that evolved during the paradigm debate. This paradigm is not committed to any philosophy or view of reality; researchers positioned within this paradigm view truth as what works at a specific time and can combine data collection and analysis methods that best address their research questions.[4] Teddlie and Tashakkori point out that when based on the pragmatic paradigm, commonly used in mixed method studies, ontology has diverse views regarding social realities, and epistemology employs objective and subjective views to explore realities depending on research types.[20] Thus, pragmatism is an overarching philosophy of mixed methods research (MMR) focusing on the research questions and multiple data collection methods; it does not require researchers to choose a particular method but to choose the most appropriate one.[11] Patton supports a similar view that pragmatism is about methodological appropriateness

as the primary criterion and different methods are suitable for different situations.[17] The pragmatic paradigm emphasises how MMR can best answer research questions.[15,23,24] The ontology of pragmatism encompasses singular and multiple realities, wherein researchers test hypotheses and multiple perspectives, bringing quantitative and qualitative studies together to gain a deeper understanding of the phenomenon.[11] The characteristics of pragmatism include the rejection of dogmatic either-or choices between positivism and constructivism, instead focusing on research questions that need to be answered and are influenced by the researcher's personal value systems.[20]

I am situated in the pragmatic paradigm. Pragmatic means 'what works', 'goal-oriented' or 'problem-centred', derived from the Greek word *pragma* meaning action, emphasising the relations between theory and practice, knowledge and action.[25] Thus, the pragmatic paradigm allowed me to choose different methods. Rather than focusing on a positivist or a constructivist approach, the focus was on how best to answer the research questions.

3.6.1. Paradigms and mixed method research

Mixed method research is a "class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study."[21] Philosophically, MMR uses the pragmatic philosophy and offers a logical and practical solution to the paradigm debates.[21] Creswell defined MMR as:

> *"A methodology and method to research in the social, behavioural and health sciences in which investigator gathers both quantitative and qualitative data, integrated and combines the two, and then draws inferences (called meta-inferences) from the integration that provides insight beyond what can be learned from quantitative or qualitative data."*[26]

When conducting mixed-method studies, researchers may take different views on philosophical assumptions, paradigms, and study methods. The formative period of MMR faced many controversies in definitions, different views on mixing paradigms, disagreements on added value while mixing quantitative and qualitative methods, and preferences for postpositivism, marginalising qualitative approaches.[5,9,11,15] Mixed methods research studies[27] are underpinned by a spectrum of philosophical assumptions from no philosophical (an a-paradigmatic stance), incompatibility thesis (where quantitative and qualitative approaches cannot be combined), to integration (mixed methods are possible, but quantitative and qualitative research must be kept separate).[20]

Creswell and Plano proposed the existence of multiple paradigms in MMR and that researchers can be in different paradigms depending on the kind of study.[11,28] Teddlie and Tashakkori proposed a dialectic stance ─ not advocating one paradigm over another but intentionally engaging multiple paradigms or philosophical assumptions for new and enhanced understandings.[20] Greene and Hall supported a similar view.[29] Other researchers viewed MMR with a methodological orientation with philosophical assumptions rather than a study method.[11] Denzin and Norman adopted MMR characteristics such as 'methodological eclecticism' ─ which means that combining qualitative and quantitative methods cancels the weakness of each method and 'paradigm pluralism' ─ a variety of paradigms can serve as philosophical orientations, a celebration of diversity, and rejection of dichotomies.[5]

3.6.2. The research paradigm for this study

A paradigm choice is not a free choice but depends on the researcher's philosophical assumptions and methodological choices when conducting research.[30] As mentioned earlier, I am situated in the pragmatic paradigm instead of positioning myself on an epistemological stance of "searching for either a single reality or only multiple socially constructed realities."[12] This positioning allows me to choose approaches and methods to enhance my understanding of the research questions.

Quantitative data provides a snapshot at a time, whereas qualitative data provides detailed information about a phenomenon,[11] making MMR the most suitable method for this project. While quantitative data explained the relationship between variables, the qualitative data explored it further, filling the knowledge gaps in answering the research questions.[31]

3.7. RESEARCH APPROACH

The term case study has multiple definitions emphasising different aspects of this approach. For example, Simons emphasises that case studies involve "in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program, or system in a 'real-life context'."[32] Miles *et al*. emphasise the "bounded context" aspect and that the studied case "can be an event, an organisation, a period, or a community."[33] Despite the different emphases, case studies are used to answer why and how questions and when we want to uncover a phenomenon in-depth in a real-world context,[34] where boundaries between the phenomenon and the context are unclear.[7]

Stake refers to intrinsic, instrumental, and collective case studies depending on the type and number of cases studied and their uniqueness.[35] In an intrinsic study, the case is chosen due to the interest in a particular case, which differs from an instrumental case study, where the case is chosen to gain insight into an issue or redraw a generalisation.[36] In an instrumental case study, "the case is of secondary interest or plays a supportive role for facilitating the understanding of something else."[36] A collective case study includes multiple cases selected and studied separately.

Case studies embrace different epistemological orientations, such as the realist and relativist perspectives integrating multiple meanings of different participants.[7] Another critical advantage is developing knowledge of real-life situations linked to human-derived behaviours rather than context-independent theories, allowing many-sided, complex stories from the participants.[37] Instead of linking to theories of

one academic specialisation, researchers can relate to broader philosophical positions with broader interpretations and make diverse conclusions.[37]

Case studies offer several advantages. They facilitate understanding the phenomenon of interest from those who personally experience it, modifying, creating, and interpreting it from their individual views.[38] Case studies explore a programme or a process that is time and activity-bound, thus collecting detailed information on the phenomenon over time.[4] Case studies provide an in-depth understanding of a phenomenon, discovering inequities in education systems, including teaching practices giving opportunities for improvement[10] and developing or revising existing policies.[34] Case study findings can be converged from multiple data sources such as interviews, document analysis and observations.[7,36,39] This case study used multiple data sources, such as interviews, the most common data gathering method,[34] and document analysis for a broader understanding of the phenomenon of interest. Many variables of interest and multiple sources of evidence make case study findings more valid and reliable.[7] Although debate continues about whether a case study is a study method or methodological approach,[32,34,37] this approach is preferred to conduct research in education, social science, and medicine due to its unique characteristics.[32,38]

Many researchers regard the perceived lack of generalisability of the case study approach as its major flaw,[1,9,34] but Yin and Flyvberg clarified how generalisability, reducing observer bias, and theory building and testing are still possible in case studies.[7,9,37] According to Yin, case study findings are generalised by analytical rather than statistical generalisation with probabilities.[7] “Analytical generalisation is a carefully posed theoretical statement, hypothesis testing or proposition which can take the form of lessons learned or any principle that could apply to other situations and presented at the conceptual level than just a case.”[7] Stake refers to naturalistic generalisation where generalisation depends on the reader who is familiar with the case from experience.[36] Hence, researchers must provide rich, detailed descriptions of the context, time, and place so that readers can generalise findings into their context.[35]

Case studies typically involve multiple types of data collection and sources. Creswell and Plano highlight integrating mixed-method case study results "to provide in-depth evidence for a case or cases."[11] This study used an instrumental case study approach to evaluate the postgraduate FM training programme in the bounded real-life context of Wits University from the perspectives of those involved in the programme, using a logic model. Other researchers have effectively evaluated an educational programme using a logic model framework in a case study.[40]

3.7.1. The case study setting

This study was conducted at five of the six districts affiliated with Wits University (Figure 3.2).

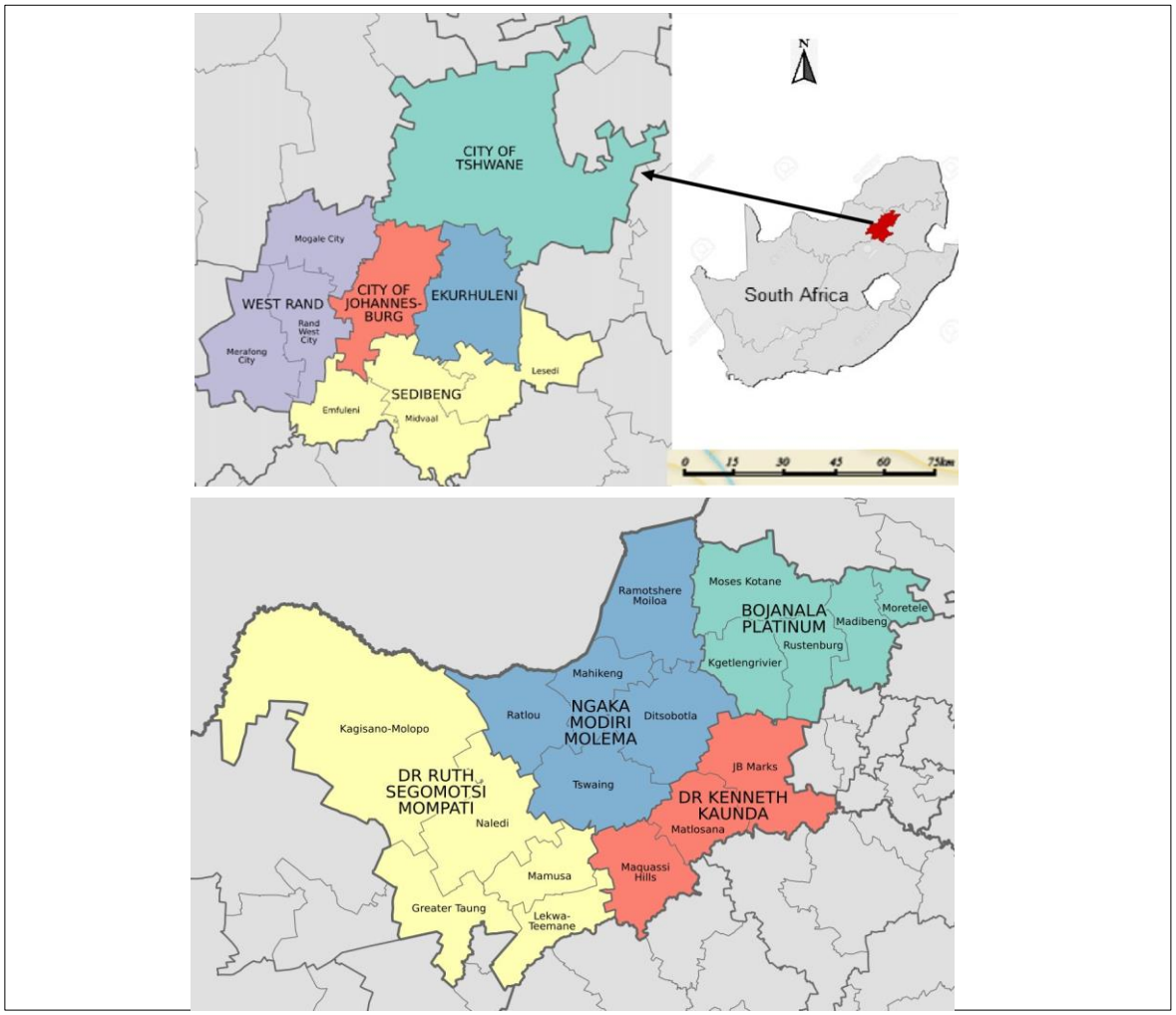

Figure 3.2: Decentralised training sites in Gauteng (top) and North West provinces (bottom)

Four districts are in the Gauteng province: Ekurhuleni, Johannesburg Metro, Sedibeng, and West Rand; the Dr Kenneth Kaunda district is in the North West province (Figure 3.2). The sixth district, Dr Ruth Segomotsi Mompati (North West province), was excluded as registrars were not being trained there when the study was conducted.

The unemployment rates in Gauteng (35.4%) and North West (35.2%) provinces are higher than the national unemployment rate of 32.9%. More than 75% of the population in these two provinces do not have medical insurance and rely on health services at PHC facilities and hospitals.[41] Table 3.1 compares the population size, density, and number of facilities across the five study sites. More than 21 million patients access the PHC facilities in Gauteng compared to over seven million in the North West.[41] Gauteng (SA's smallest province) is more densely populated (869.8 people per km^2) than the larger North West province (39.3 people per km^2),[41] and has more medical practitioners (4331) and specialists (1826) working at the various health facilities compared to the 1018 medical practitioners and 140 specialists covering the whole North West province.[41]

Table 3.1: Population, population density and number of public health facilities across the study districts (Source: District Health Barometer 2019/2020)[42]

District	**Population**	**Population density People per km^2**	**Total area km^2**	**Number of facilities**	**Number of hospitals**
Johannesburg Metro	5,316,219	3018.4	1645	• 108 PHCs • 11 CHCs	• 2 district hospitals • 2 regional hospitals • 3 tertiary hospitals
Ekurhuleni	3,409,252	1975	1752.4	• 84 PHCs • 9 CHCs	• 1 district hospital • 3 regional hospitals
Sedibeng	995,666	230.4	4173	• 30 PHCs • 8 CHCs	• 2 district hospitals • 1 regional hospital
West Rand	890,241	211.2	4087	• 45 PHCs • 3 CHCs	• 2 district hospitals • 1 regional hospital
Dr Kenneth Kaunda	772,320	54.7	14671	• 30 PHCs • 10 CHCs	• 1 district hospital • 1 regional hospital • 1 tertiary hospital

3.8. METHODS

3.8.1. Study design

This study used a parallel convergent mixed methods design (see Figure 3.3).

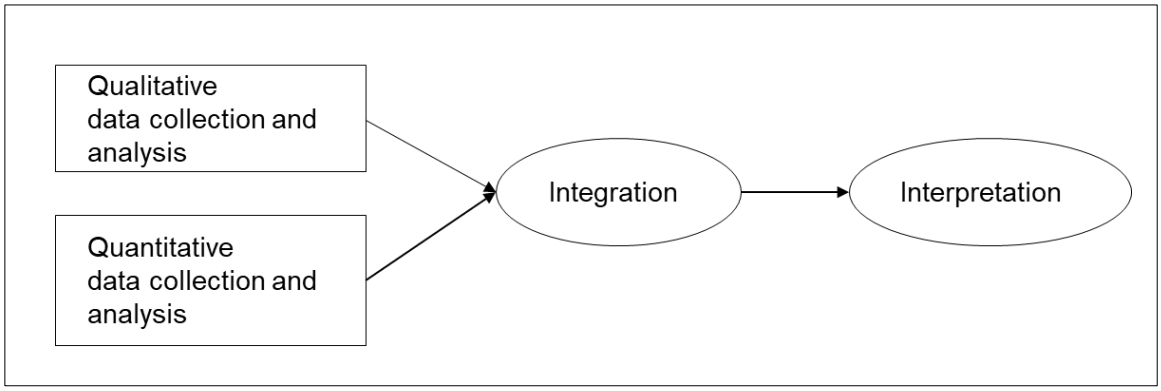

Figure 3.3: Convergent parallel mixed methods case study design (adapted from Creswell and Plano)[4]

3.8.2. Study population and sampling

Mixed methods research sampling typically involves more than one sample.[20] This study sampled two populations from the 2020 training year: FPs (n=20) and registrars (n=21). The registrars' LPs (n=20) were used as a data source for the quantitative component of the study.

All sampling for the study was purposive. Purposive sampling involves selecting individuals or sites purposefully to inform an in-depth understanding of a context [43] or depending on whether the cases possess the characteristics being sought.[11,43] Purposive sampling helps achieve representativeness of the settings, capturing adequate heterogeneity of the population, getting the entire range of variations and examining critical cases to establish comparisons or illuminate the differences between settings or individuals.[30] This study used intensity purposive sampling. Intensity purposive sampling involves researchers having sufficient prior knowledge to sample intense examples of the phenomenon of interest across the study sites.[17] Other types of purposive sampling, such as extreme case sampling, homogenous

sampling, critical case sampling, criterion sampling or snowball sampling[17] were less suitable for this study.

3.8.2.1. Sampling of the family physicians

All FPs employed as joint appointees[g] with the university and at the district were eligible to participate in the study. Family physicians registered with the Health Professions Council of South Africa as specialists,[44] but not appointed in a specialist joint appointee post, were excluded from the study. Family physicians employed as medical officers[h] within the districts may be partly involved in training registrars. However, if they do not have a specialist post, they may be allocated fewer responsibilities than a joint appointee and were thus excluded from the study.

The purposive sampling involved selecting FPs from all the training sites, with adequate gender representation and varying levels of training, experience and responsibility in the department, including those occupying important positions at the university and the district simultaneously (such as head of departments or head of district FM units). The FPs manage multiple roles and responsibilities, which could vary across the districts. Some FPs focused more on than one role (for example, clinical and administrative), so their roles were considered when sampling FPs from various districts to maximise the representation of FPs with various roles.

Data saturation was used to determine the sample size for FPs through an iterative qualitative data collection and analysis process. Data saturation is associated with constant comparison in grounded theory analysis.[9,45] Saturation is reached when no new dimensions, insights, codes or categories are identified, even when new data is added.[4,9] The final sample size was 11 FPs.

3.8.2.2. Sampling the registrars

[g] Specialists jointly employed by the Provincial Department of Health and the university are known as joint appointees.
[h] Medical officers are doctors working as general practitioners but not appointed as specialist family physicians.

Among the 21 registrars, only 14 second- and third-year registrars were invited to participate in the study. First-year registrars were not invited as they were deemed to have insufficient experience of the programme to be able to comment on training. Registrars in the fourth year or more of training were excluded as they were not actively participating in the yearly registrar training programme in the district. Registrars were purposively sampled to represent all the districts and gender distribution. As discussed in the previous section, the sample size was determined by the number of interviews required to reach data saturation. The final sample consisted of 11 registrars.

3.8.2.3. Sampling the learning portfolios

The LP components used in this study are shown in Table 3.2.

Table 3.2: LP components used in this study

Learning portfolio	Scores for each of the seven sections of the portfolio (n=7)
	Total scores
Learning plan	Total scores
	Supervisors' feedback
Mini-CEX form	• Total scores • Sectional scores
	Supervisors feedback
Skills logbook	Self-reported skills competence levels

One registrar deregistered from the course during the year, so 20 learning portfolios were submitted. Figure 3.4 shows how the 19 evaluated LPs were obtained. One of the 20 registrars who submitted portfolios did not consent to their LP being evaluated, leaving 19 LPs.

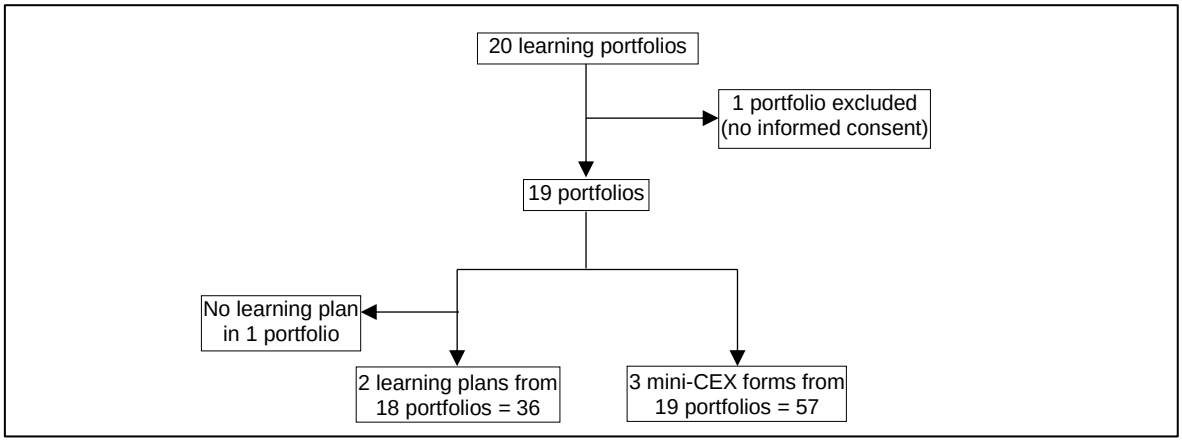

Figure 3.4: Learning plans and mini-CEX forms in learning portfolios

3.8.3. Data collection

3.8.3.1. Qualitative data collection

I chose to conduct interviews rather than focus group discussions for several reasons. Individual interviews helped me to explore a particular topic, allowed a flexible, iterative approach, gave access to participants' in-depth understanding and perceptions, and avoided situations where dominant people took over the discussions.[10] Focus group discussions are better used to explore social norms, while individual interviews best address matters of personal belief.[46] Also, sensitive topics were best explored in individual interviews rather than group settings.

3.8.3.2. Type of interview

The three types of interviews offer different benefits.[17,20] Unstructured interviews build rapport and elicit spontaneous responses, getting in-depth information.[20] Unstructured interviews may be difficult to guide and rely highly on the interviewer's skills. Structured interviews are rigid, allowing no flexibility for altering the questions or probing areas that need more clarity,[20] but the rigid, predetermined questions and sequencing[17] increase response comparability.[20] Semi-structured interviews allow a systematic and comprehensive approach to the concepts of interest,[17] provide opportunities to explore, probe and ask questions to illuminate a particular topic and represent the best use of available time.[47] The conversational style of semi-

structured interviews[20] was most appropriate for this study; it allowed in-depth exploration needed to understand each participant's perspectives comprehensively.

3.8.3.3. Developing the interview schedule

Two interview schedules were developed for the study: one for the family physicians and one for the registrars.

Interview schedule for the family physicians

The interview guide for family physicians (Appendix A) consisted of an initial section on demographics and background information about previous qualifications, training experience, and current positions in the district.

Subsequent sections of the guide asked about their perceptions and experiences of the training programme: resource availability, support systems, supervision, learning at the workplace, learning opportunities and learning environment. The interview questions were informed by the research questions, my understanding of the programme, and the context in which it was being evaluated. The interview guide was face-validated[48] by my supervisors until agreement was reached on the wording and sequencing of the questions. Face validity refers to accepting research findings about what is obvious, makes sense, or is plausible and believable.[48] As a novice qualitative researcher, I practised conducting interviews with one of my supervisors before interviewing the participants.

Procedure during the interviews

All interviews were conducted with consenting FPs and registrars between March and August 2020. Voluntary informed consent (Appendix C) was obtained from each participant before the interviews. I initially intended to conduct all the interviews face-to-face, but the COVID-19 lockdown resulted in most (14/22) being conducted electronically. The face-to-face interviews were conducted at participants' workplaces or on Zoom or Microsoft Teams meetings according to participants' convenience. Separate informed consent was sought for the interviews and the

audio recording (Appendix D). All interviews were conducted in English and lasted about 80 to 90 minutes.

3.8.3.4. Quantitative data collection

Table 3.3 provides an overview of the instruments developed to collect the quantitative data from the LPs. Registrars' quarterly assessment (QA) scores (scores given in mini-CEX assessments by an external supervisor from another district) and their examination results were obtained from university records.

Table 3.3: Quantitative data collection tools

Tool	**Source of data collected**
Learning plan scores and supervisory feedback (Appendix E)	Learning plan
Mini-CEX scores and supervisory feedback (Appendix F)	Mini-CEX form
Evidence of Learning (Appendix G)	LP total scores (LP)
	LP sections scores (LP)
	Self-reported skills competence levels (LP)
	QA scores (university records)
	Examination results (university records)

Learning plan scores and supervisory feedback tool

An existing validated tool developed by one of my supervisors at a South African university[49] was modified, in consultation with this supervisor, for use in this study (see Appendix E). In addition to collecting the feedback and global scores from the sections in registrars' learning plans, the training year and district were also recorded. A copy of the learning plan in the registrar LP is included in Appendix H.

Mini-CEX scores and supervisory feedback tool

The tool was developed to assess the feedback in all seven competency areas and the general feedback section in the mini-CEX forms. It included the registrar's year of training and training district. The total scores and scores for various mini-CEX competencies were extracted using the data collection tool (see Appendix F). A copy of the mini-CEX tool in the registrar LP is attached in the appendix (Appendix I).

Evidence of learning tool

This data collection tool captured evidence of learning in the sections in the LP and the logbook skill set (Appendix G). It was used to collect the following proxy measures of the registrar's knowledge and skills:

- Total LP scores, scores for different LP sections and self-reported skills competence levels.
- QA scores and university and college examinations pass/fail decisions.

Data were collected from the learning plans and mini-CEX forms at the end of 2020. However, the final formative assessment scores from the LP for 2020 were only collected in January 2021 after portfolio submission, which was delayed by the COVID-19 lockdown. The scores for quarterly assessments, university examinations, and pass or fail outcomes of the CMSA examination were obtained from the university records.

Interview schedule for the registrars

The first section of the interview guide developed for the FPs was modified for the registrars by adding questions on their PHC experience, undergraduate training, and postgraduate qualifications (Appendix B).

3.8.4. Data Analysis

3.8.4.1. Qualitative data analysis

The semi-structured interviews were audio-recorded and transcribed verbatim. The transcripts were deidentified and thematically analysed using the Braun and Clarke six-step approach.[50] MAXQDA2022 was used to manage the analysis.

Thematic analysis systematically identifies, organises and offers insights into patterns of meaning (themes) across the data sets. It allows the researcher to see and make sense of shared themes and experiences.[50] The six-step approach comprises the following: data familiarisation, generating initial codes, searching for

the themes, reviewing potential themes, defining and naming themes, and producing the report.[50]

Data familiarisation

After checking the transcripts for fidelity, I familiarised myself with the data through multiple readings. The initial readings were more superficial, focused on developing a sense of the overall information and allowing reflection on the overall meaning without much more profound understanding.

Generating initial codes

Coding is organising the text and segmenting sentences into categories.[4] Coding condenses chunks of data into analysable units, and the codes assigned to text segments serve as prompts or triggers for deeper reflection on the data meanings.[33] I used inductive coding in this study. Inductive coding allows researchers to discover patterns, themes, and categories from the data, whereas deductive coding considers the framework guiding the research[17] and measures the relative attainment of predetermined clear, specific and measurable goals.[47]

Some transcripts were open-coded[2] using Tesch's eight steps of the coding process[51] to develop an initial coding system. The steps involved getting a sense of the whole by reading all transcripts, picking one document, going through it, making sense of underlying meaning, and continuing with other transcripts, similarly making a list of all topics. Then clustered similar topics in the list, and with the topic list, went back to the data for coding. One of the supervisors checked the initial coding system until an agreement was reached. The second supervisor was engaged to finalise the initial codes which were then applied to the coding system of the other transcripts. Any new codes or categories identified were included in the coding system. A code book was developed through iterative consultations with supervisors to improve the inter-coder reliability. I used memos in MAXQDA to promote researcher reflexivity.[43] Written memos allow researchers to capture their thinking about relationships between codes and make analysis more visible and retrievable.[30]

Identifying themes

The initial codes were grouped into sub-categories depending on the similarities and then grouped into categories to represent a coherent and meaningful pattern from the data. The categories were developed as substantive,[30] providing insight into what is happening. “Substantive categories are more descriptive, staying close to participants’ concepts and beliefs and data categorised but not implying abstract theories.”[30] The process of category generation allows noting the patterns expressed by the participants and categories, which should be internally consistent but distinct from one another,[1] which was done when developing categories. Similar categories were merged into sub-themes and then into themes. There were multiple engagements with my supervisors while developing the themes. The final coding hierarchy of codes, sub-categories, categories, sub-themes and themes resulted from iterative consultation with my supervisors.

Reviewing the themes

The themes identified were checked for clarity and coherence by my supervisors. The entire data set was revisited, with some coded data sets being moved to fit under other themes or even discarded.

Naming and defining themes

A developed theme should stand alone, not overlap with other sub-themes, but be related to other themes.[50] In this step, theme names were developed to explain what is specific about each theme. The theme names were reviewed for their uniqueness. Thematic maps were created to show the relationships between the themes more logically.[50] Finalising the theme names involved further supervisor consultations.

Writing up the report

The final step involved publishing the findings (see Chapters 4, 5, 6, 7) or submitting them for review (Chapter 8) and presenting my work at national and international conferences. The themes were presented eloquently and rationally to tell the story collected from the data. The developed themes were validated using appropriate excerpts from the data included in all the chapters.

3.8.4.2. Quantitative data analysis

Three types of quantitative data were analysed from the LPs: supervisors' feedback in the learning plans and mini-CEX, registrars' learning plan and mini-CEX scores, and registrars' knowledge and skills.

Supervisors' feedback

The written narrative feedback from the learning plans and mini-CEX forms were statistically analysed for the quantity and quality of supervisory feedback. The quality of the narrative written feedback was assessed using content analysis. Content analysis involves coding textual data and deriving counts of the coding categories.[27] The feedback in the learning plans and mini-CEX forms was imported into Microsoft Excel and coded using words that reflected the content of the data. The codes were then grouped into sub-categories, and categories and frequencies were derived for each level of the coding hierarchy. The content analysis results are reported in Chapter 7. Content analysis is context-sensitive and allows researchers to process texts that are significant, meaningful, informative, and representative of others.[48]

Registrar scores

All the scores extracted, which included global scores from the learning plans and the total and section scores from the mini-CEX forms, were analysed. Descriptive statistics for frequencies and percentages were done using STATISTICA 13.5.0.17[52] and STATA14.2.[53] The association between the different categorical and continuous variables was assessed using appropriate statistical tests, and statistical significance was determined as a p-value < 0.05. The variables were compared across the training districts and years of training. The quantitative statistical analysis is explained in detail in Chapter 7.

Evidence of learning

The evidence for learning from WPBAs captured in LPs, quarterly assessments, and assessments from university and college examinations were statistically analysed using STATA 14.2 software. Median and interquartile ranges were

determined for the continuous variables, and frequencies were determined for categorical variables. A detailed description of the analysis can be found in Chapter 8.

3.9. INTEGRATION OF QUALITATIVE AND QUANTITIVE FINDINGS

The final step in this mixed-methods case study was integrating the quantitative and qualitative findings and drawing meta-inferences from the integrated data. Figure 3.5 provides an overview of the process, which will be described and discussed in Chapter 9.

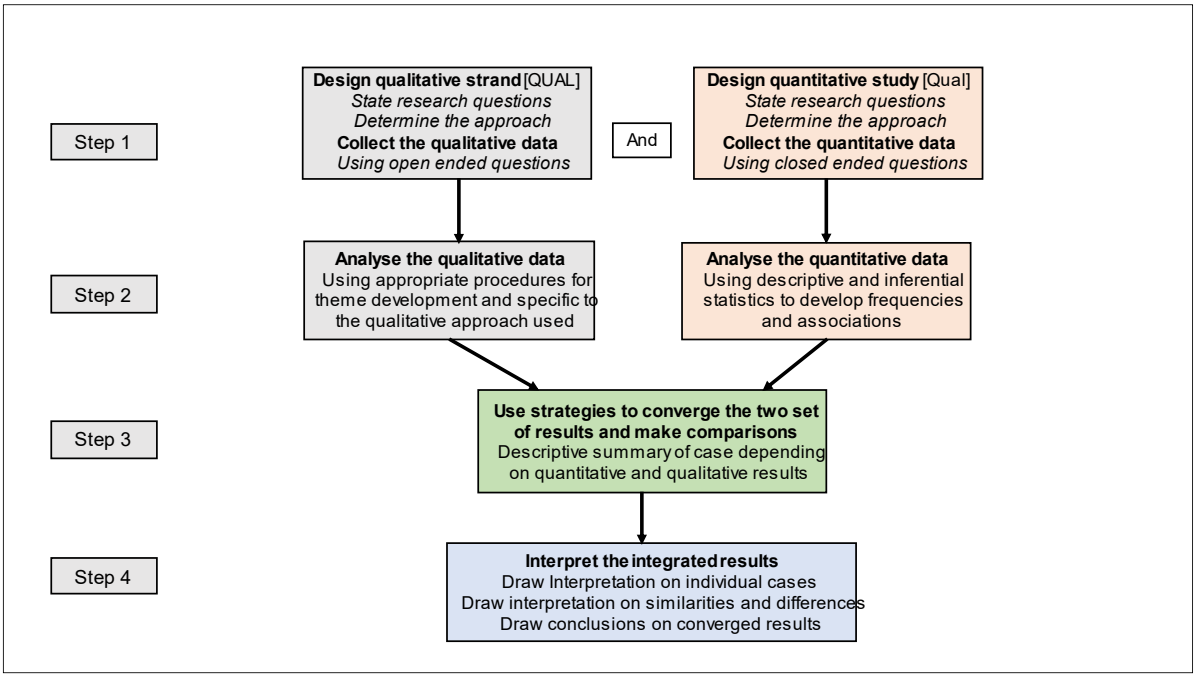

Figure 3.5: Mixed method integration analysis in this case study (adapted from Creswell and Plano)[11]

3.10. ETHICAL CONSIDERATIONS

Ethical approval to conduct the study was obtained from the University of the Witwatersrand's Human Research Ethics Committee (Medical) (Appendix J). Permission was also obtained from the Provincial Research Committees of the

Gauteng and North West Provinces, the Registrar of Wits University, and the Head of the Department of Family Medicine.

Researchers must adhere to sound ethical principles and practices. Elements of good research ethical practice relate to obtaining informed consent, maintaining adequate confidentiality, privacy and anonymity, avoiding harm or minimising risk to participants, maintaining research integrity and accuracy of data, protecting and safety of the data collected, and avoiding misinterpretation or misuse of the results.[4,33] Informed consent refers to the right of participants to be informed about the nature of research and any consequences from participating or not participating and is consistent with a commitment to individual autonomy.[54]

Informed consent (Appendix C) was sought from each potential participant before the interviews were scheduled for the qualitative component of the study. Participant confidentiality was protected by deidentifying[4,33] the interview transcripts and assigning pseudonyms to both groups of participants (i.e., FPs and registrars). All participants were allocated numbers (RG 1-11 and FP 1-11) before transcribing the interviews. The audio recordings and interview transcripts were stored in a password-protected folder on the researcher's personal computer, which is also password-protected. Finally, no identifying details were used in research outputs or publications.

Informed consent was obtained from the registrars to access their LPs (Appendix R) and supervisors to assess the feedback sections for the quantitative component of the study. (Appendix S) Informed consent was sought separately from the registrars after their final submission in January 2021 to access the LP total and sectional scores and self-reported skills competence levels (Appendix T).

3.11. RESEARCH RIGOUR

Rigour refers to the methods used to improve research reliability and validity. Quantitative and qualitative research use different conceptualisations of these constructs. In quantitative research, reliability refers to the extent to which the

research processes and results can be reproduced.[55] The several forms of validity make it a complex concept. Validity can never be achieved but can be maximised, especially by minimising threats which undermine it.[9] Three main types of validity are construct, internal and external validity. Construct validity refers to the strength of the inferences drawn.[9] Internal validity refers to the 'truth value' of the findings in quantitative and qualitative studies.[9,56] Construct and external validity (generalisability of the findings from the sample to the population) improve the robustness of results, reducing the uncertainty around findings.[9,14,56]

Efforts to improve the rigour of MMR's qualitative and quantitative components should be discussed separately,[9,11] as was done in this thesis. Trustworthiness, the process to improve the rigour of qualitative research,[57] uses different interpretations of validity from quantitative research.[56] The following trustworthiness criteria (proposed by Lincoln and Guba) were used in this study: credibility (truth value), transferability (generalisability), dependability (reliability) and confirmability (neutrality).[14]

3.11.1. Rigour in mixed methods case studies

The strength of single case studies, their focus on the in-depth investigation of a single case, is also their greatest weakness, as it limits generalisability. There are several ways to improve the rigour of case studies.[7,11,33] The generalisability or transferability of findings is enhanced if the single case represents the class of cases, and findings can be extended from part of the case to the whole case or from a single case to multiple similar cases and could extend from a single case to a theoretical generalisation.[9] Thick descriptions will assist readers in deciding the extent to which MMR case study findings can be transferred to their setting.[14] Dependability is improved by connecting research to existing theory.[34] Combining qualitative and quantitative research methods to explore the study phenomenon improves credibility.[7] Prolonged engagement, persistent observation, peer debriefing, triangulation, and member checks also improve credibility in naturalistic enquiries such as case studies.[14]

3.11.2. Trustworthiness of the qualitative component

Strategies that can be used to improve the different trustworthiness criteria are discussed below. The steps taken to improve trustworthiness in this case study are summarised in Table 3.4. (pages 90-91).

3.11.2.1. Dependability

The following methods improve dependability: storing the data in a database for easy access and retrieval; organising it according to the source detail, time, and date of collection; storing it in a database[7] and keeping an audit trail of how data management was done and how codes and categories were developed.[58] Intercoder reliability, the extent to which two or more independent coders agree on coding the content of interest with an application of the same coding scheme,[59] enhances the coding frame's robustness and application.[60]

3.11.2.2. Credibility

Methodological triangulation using multiple methods such as interviews and documents, data triangulation, and data collection from various data sources, for example, people of different statuses,[14] improves internal validity and dependability.[7,47] In MMR, methodological triangulation compares results from quantitative and qualitative methods for convergence or divergence.[11] Methodological triangulation highlights the relationships and links which may not be apparent when results are analysed separately.[61] Comparing quantitative and qualitative results from multiple sources of evidence broadens the understanding of the single case, enhancing concurrent validity.[9] Concurrent validity is achieved when data gathered using one instrument correlates with the data collected using another.[9] Triangulation helps to understand the relationship between the variables better and reduces researcher biases and blind spots.[34] Purposive sampling[9,43] double coding (recoding and relabelling codes and categories) enhances credibility. Checking for discrepant evidence and negative cases during analysis and presenting them augment credibility.[14,30]

3.11.2.3. Transferability

The value of qualitative research is on particularity, focusing on a particular description and the themes developed from a specific context.[4] Detailed descriptions of the study methods, including setting, sampling, inclusion, and exclusion criteria, improve transferability.

3.11.2.4. Confirmability

Reflexivity involves self-critiquing, asking difficult questions and keeping a detailed reflex log about the time, people met and activities undertaken for each data set to improve the confirmability of the findings.

Table 3.4: Steps taken to improve the trustworthiness in this case study (based on Yin,[7] Creswell et al.,[11] and Miles et al.[33])

Dependability	The researcher's role and status in the research were described.
	The basic paradigm and analytical constructs used in the research were specified and connected to theory.
	All data sources, participants, and the data collection period were described.
	Data were collected from all study sites and two groups of participants (family physicians and registrars) with adequate representation of all study sites to compare and contrast findings between the groups.
	Interview recordings were transcribed verbatim and coded.
	The codes were cross-checked until an agreement was reached with the co-supervisors, which improved intercoder reliability.
	All data were stored in a password-protected database according to the various data sources, time and date of collection for easy access and retrieval.[7]
	A codebook was developed.[58]
	The reflexivity section provides my background and experience and discusses how this could have influenced the interpretation or construction of meanings.
Credibility	I understand the study settings well, having worked in one of the districts before and after the research. I have also had multiple visits to other districts for training and assessments.
	The study write-up uses meaningful, thick descriptions when reporting the findings and quotes from verbatim transcriptions to convey participants' perceptions and experiences.
	The findings from the two groups of participants, i.e., family physicians and registrars, were triangulated wherever possible, i.e., data were collected, analysed separately and compared for convergence or divergence.
	All quantitative results and qualitative findings were integrated to answer the overarching research question (see Chapter 9).
	Efforts were made to present the findings clearly and coherently.
	I actively looked for alternative explanations, and negative evidence and excerpts were reported.
Transferability	A detailed, thick description of the study methods, including settings, sampling, characteristics of the sample, inclusion and exclusion criteria, and other processes, was provided.
	The study limitations due to sample selection were acknowledged, and the generalisability of the critically examined.

	The wording of the research questions (how and why questions[7]) improved transferability
	Theory was used to connect the research to existing theory, which improves transferability. In this study, the logic model was developed based on linearity theory.
	The thesis included the possibility of how and where the findings could be tested further.
Confirmability	Detailed records of the study methods and procedures were kept in case needed for an audit.
	The data collection, processing, and condensing sequence has been safely stored. This information can also be accessed using the MAXQDA software.
	A record of the decisions about how and why codes and categories were grouped, themes developed, reviewed, and renamed through iterative cycles of checking with my supervisors.
	Reflexivity was augmented by self-critique involving difficult questions and keeping a detailed reflex log about the time, person met, and activities for each data set collected.

3.11.3. Validity and reliability in the quantitative component

Three types of quantitative data were analysed in this study:

1. The supervisors' feedback and scores using the 'Learning plan scores and supervisory feedback tool.'
2. The supervisory feedback sections and scores were extracted from the 'Mini-CEX scores and supervisory feedback tool.'
3. Registrar knowledge and skills were collected using the 'Evidence of learning tool.'

Construct validity refers to the extent to which the scores received from participants are meaningful indicators of the construct being measured.[11] Reliability refers to the consistency and stability of the scores received from the participants over time.[11]

The quantitative tools or instruments developed to evaluate the feedback were constructed in consultation with the co-supervisor who developed the validated tool. The original variables were modified to increase the construct validity of the modified tool. Construct validity is affected by the meaning, definition and operationalisation of the variables selected.[9] When proxy variables are used to measure a construct, the accuracy of the proxy variables to measure the construct is essential and affects the validity of the results.[9] In this study, supervisory feedback was used to evaluate supervision, and the evidence for registrar learning was assessed by the AfL and AoL marks achieved by the registrars, which were used as proxy variables. The influence of dependent variables such as feedback and assessment scores depending on independent variables such as training district and year of training were also evaluated.

The feedback characteristics evaluated were adapted from validated tools used previously in SA and other HIC settings.[49,62] Data collection tools used for the assessment and skills scores were adapted from the registrars' LP, which is used nationally. The tools included multiple independent and dependent variables. The variables were registrar training district, training year and scores achieved for quarterly assessments, total LP marks and various LP sections, and registrar

logbook self-assessment skill scores. These were proxy measures for registrar knowledge and skills to improve validity and reliability.

3.12. REFLEXIVITY

Qualitative researchers are an inseparable part of the social world researched, a social world that has already been interpreted by the participants, which may undermine the impression of objective reality.[63] Reflexivity recommends that researchers consciously acknowledge, interrogate, and divulge their position and influence on the research.[9] Reflexivity emphasises the importance of self-awareness, political and cultural consciousness, and perspective ownership.[17] Bettez et al. specified that including the researcher's positionality in terms of race, class, gender, personal experiences, beliefs, and background is critically important in qualitative research.[64]

I was born in India, where I completed my undergraduate medical degree. After graduation, I worked in the PHC contexts in Botswana. I later moved to SA, where I have trained undergraduate and postgraduate medical students since 2009, first in district hospitals and later in CHCs. I developed my interest and passion for training during this period. During my undergraduate training, I was exposed to teacher-centred approaches, which influenced my initial career as a clinical trainer. My initial strength was sharing knowledge with trainees. However, over my nearly 25 years of PHC experience, I transitioned to practically engaging trainees in clinical settings. This experience has substituted for formal medical education training.

For the past 14 years, I have held a joint appointment with Wits University and the Gauteng Provincial Department of Health as an FP in the Ekurhuleni Health District. While working as a district education coordinator for over five years, I played a significant role in organising and leading the training activities in one training district. I also participated in various student training activities and chaired the LP committee of the FM department at Wits University. For many years, I had the opportunity to participate in registrar summative and formative assessments at their workplaces in all these decentralised training sites. Ekurhuleni Health District hosted more

quarterly assessments than other training districts in previous years as part of AfL conducted by Wits. These opportunities allowed me to observe the numerous district-specific training activities critically. All these training activities allowed me to engage with many registrars and FP supervisors from other districts before the study commenced.

During my training and visits to other training sites, I became aware of the challenges due to the lack of equipment and trainers and the time constraints FPs were experiencing because of their multiple responsibilities. I also noticed that the registrars could not practice the required skills they learned during hospital rotations because of insufficient equipment or medications. I observed the lack of support and understanding of FM decentralised training from higher authorities and district managers in the district health system, even though improving decentralised training and services is a national priority.

In 2019, before this study commenced, I moved from the position of an academic coordinator to a clinical trainer and supervisor and have since been based at one of the CHCs within the district. This change was designed to minimise my influence as a researcher during training activities and evaluations. My only responsibility was supervising the registrars and students at my training site.

The teaching and training short courses offered by the SA Academy of Family Physicians and Wits University that I attended helped me in my personal and professional development as a clinical trainer and supervisor. It augmented my interest in exploring the decentralised training programme at sites affiliated with the university to identify the successes and challenges of the programme. The overall intent was to improve the programme by emulating the successes, addressing the challenges, and developing ideal decentralised training complexes.

3.13. REPORTING THE RESULTS

The results of this study are reported in the following five chapters, as outlined in Table 3.5.

Table 3.5: Reporting of results by chapter

Research question	Data and Source	Publication and Chapter
1. What human and other resources were available in the postgraduate FM training programme at Wits University during 2020?	FP and registrar interviews	Perceptions of resources available for postgraduate family medicine training at a South African university (Chapter 4)
2.1 What are Wits family physicians' and registrars' perceptions of the supervision in the FM training programme at Wits University during 2020?		Perceptions of postgraduate family medicine supervision at decentralised training sites (Chapter 5)
2.2 What are Wits family physicians' and registrars' perceptions of the learning in the FM training programme at Wits University during 2020?		Workplace-based learning opportunities: Perceptions from a South African family medicine postgraduate training programme (Chapter 6)
3 What is the nature and extent of supervisory feedback in Wits University registrars' learning portfolios from 2020?	• Learning plan total marks and supervisor feedback • Mini-CEX total and sectional marks and supervisor feedback	Evaluating postgraduate family medicine supervisor feedback in registrars' learning portfolios (Chapter 7)
4 How and to what extent do Wits University registrars' knowledge and skills in formative and summative assessments during 2020 provide evidence of learning?	• Learning portfolio sectional and total marks • Skills logbook total marks and self-reported competence levels • QA and examination marks	Evidence of Learning in Workplace-based Assessments in a Postgraduate Family Medicine Training Programme in South Africa (Chapter 8)*

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3.14. CONCLUDING REMARKS

This chapter described the philosophical assumptions, the rationale for adopting a case study approach, study methods used, ethical considerations, and strategies to improve research rigour.

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CHAPTER 4. PERCEPTIONS OF RESOURCES AVAILABLE FOR POSTGRADUATE FAMILY MEDICINE TRAINING AT A SOUTH AFRICAN UNIVERSITY

4.1. INTRODUCTION

This original research article was published in the **African Journal of Primary Health Care & Family Medicine**:

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This article presents the family physicians' and registrars' perceptions of the resources and the support available in the postgraduate family medicine decentralised programme as the 'inputs' of the logic model.

I presented this research at the Conference of the Association for Medical Education in Europe, hosted in Lyon, France, on 27–30 August 2022.

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Perceptions of resources available for postgraduate family medicine training at a South African university

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Background: Clinical training is one of the roles of family physicians (FPs) in decentralised postgraduate training. Effective training requires skilled trainers and sufficient resources. Little is known about the resources available for decentralised clinical training in district health systems in low- to middle-income countries, especially in sub-Saharan Africa.

Aim: To explore FPs' and registrars' perceptions of the available resources in a decentralised postgraduate family medicine (FM) training programme.

Setting: Five decentralised training sites affiliated with the University of the Witwatersrand across two provinces in South Africa.

Methods: This qualitative study forms part of a broader project evaluating a FM registrar training programme using the logic model. Semistructured interviews were conducted with a purposive sample of 11 FPs and 11 registrars. The interviews were transcribed verbatim and analysed thematically.

Results: Three themes were identified: 'Impact of resource constraints', 'Family physicians' skills and knowledge could be further improved' and 'Family physicians need additional support to optimise their training role'. The additional resources needed include more FPs, equipment, infrastructure and funding. Knowledge and skills of FPs were reported variable and needed further improvement. Additional support was required from peers, the district management and the university.

Conclusion: Well-resourced decentralised training environments with sufficient skilled trainers and adequate resources are needed to positively influence FP training and supervision, especially in middle-income countries like South Africa.

Contribution: Clinical trainers need adequate resources and support from peers, district management and the university for effective decentralised clinical training.

Keywords: Clinical trainers; decentralised training; family physicians; family medicine; postgraduate training; registrars; resources; faculty support.

Background

The World Health Organization advocates expanding medical education to create socially accountable healthcare workers to meet the needs of communities.[1,2] Decentralised clinical training (DCT) is a recognised strategy for transforming health professions education to meet community health needs.[3,4,5] Family medicine (FM) plays a critical role in addressing the health needs of communities through providing primary healthcare (PHC).[3,6,7,8] Despite many countries having recognised the value of training primary care physicians in decentralised settings,[6,8] effective training requires sufficient resources and skilled trainers. Decentralised clinical training poses several challenges relating to resource provision and adequate trainer skills, which are accentuated in resource-constrained countries.

The scope and structure of FM and DCT vary widely between high- and low-middle income countries.[3,6,8] The United Kingdom, United States of America and Canada have established FM training programmes, while India and China are still establishing the discipline because of human resource shortages and a lack of support for PHC.[6,7] The global situation is mirrored in Africa, where

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countries like South Africa (SA), Nigeria and Ghana have established training programmes and are collaborating with other countries.[8] Many African countries, including Rwanda and Tanzania, are still establishing FM training programmes. The focus of FM training in many African countries differs from that in high-income countries because of the high prevalence of a quadruple burden of disease.[9,10,11,12] Another difference is that FM training in Africa is based in district health systems comprising clinics, hospitals and the community, compared with general practice settings in high-income countries.[3,6,8] District health–based training requires family physicians (FP) in sub-Saharan Africa to have sufficient skills and competencies to work anywhere in the district health system and function as consultants in district hospitals.[3,7,13]

The upscaling of FM across African countries requires well-equipped district training complexes with adequate infrastructure, information technology, equipment, funded posts for FPs and trainees and enough FPs as clinical trainers.[13] Other necessary resources include a good patient mix, clinical trainers with adequate skills, knowledge and attitudes and appropriate trainer-to-trainee ratios.[4,14,15] University mission statements should also align with PHC expectations to allow learning outcomes to be achieved in the district health system outside tertiary institutions.[15] Decentralised clinical training requires a shared vision integrating a learning culture and clinical training at decentralised sites.[14,16]

Effective clinical trainers and the clinical supervisory relationship between the trainer and trainee are fundamental in FM DCT. The role of the clinical trainer is complex, requiring good clinical reasoning skills and knowledge,[17,18] sound interpersonal skills and an empathetic and respectful attitude towards patients.[17,19] The role requires a passion for teaching and commitment to excellence, the ability to establish rapport, communicate effectively with trainees and contribute towards a positive learning environment that reflects trainee needs.[17,18,19,20] Effective clinical trainers should embody personal characteristics like enthusiasm,[18,21] honesty, competency and compassion.[20] They should self-evaluate, reflect on their teaching and adapt the training to the trainee's learning needs.[19]

The characteristics of individual clinical trainers influence the clinical supervisory relationship between the trainer and trainee, which is regarded as the most vital factor for effective training.[21,22] This relationship is enhanced by role modelling, trust between the trainer and trainee and the ability to adjust to a particular role.[21] The potential barriers to a good relationship include trainer–trainee conflicts, power imbalances, hierarchical cultures, a lack of personal contact, limited trainer availability, emotional distancing from trainers, excessive workload, physical environment not conducive for training, a lack of incentives and rewards and insufficient training resources.[21] Other potential challenges to the supervisory relationship include the multiple roles trainers need to fulfil, possibly during the same clinical encounter, and time constraints because of multiple areas of responsibility.[19]

Decentralised clinical training poses several challenges, even in high-income countries. A study from the United Kingdom drew attention to the impact of heavy workloads and resource shortages on clinical training and highlighted the need for protected time for training and other educational responsibilities.[16] Trainers and trainees felt unappreciated by the district management and perceived a lack of support from senior clinical managers.[16] They also felt the district management was unaware of the impact of clinical training in the workplace and was only concerned about meeting clinical targets.[16]

Providing adequate resources for postgraduate training programmes in sub-Saharan Africa is challenging. Previous studies across various specialities, including FM, reported a lack of training standards and locally relevant curricula, unstructured programmes, excessive workloads for trainees, inadequate bedside teaching and reliance on other trainees for learning.[23,24,25] Another challenge relates to influencing the quality of the training provided by clinical trainers employed by health departments who run the university programmes at decentralised sites.[23] Other studies described infrastructure and Internet availability shortages in some sub-Saharan decentralised settings,[26,27] suboptimal conditions of health facilities and educational resources and inadequately maintained equipment.[23,24] There have been positive reports of trainees in some settings who were satisfied with the infrastructure and equipment availability at PHC clinics in postgraduate programmes[28] and adequate support from other regional universities, staff commitment and protected time.[24] South Africa is not exempt from the challenges related to providing sufficient resources and support for DCT. Although no studies on an in-depth evaluation of resource availability could be found, some universities reported having invested in infrastructure and equipment, including information technologies and Internet connectivity.[29] There is a lack of clarity around the roles and responsibilities of clinical trainers, who provincial health departments and relevant universities jointly appoint.[29] Previous studies have suggested that DCT in SA could be strengthened by longitudinal relationships between stakeholders, including universities, health departments, health managers and other health professionals.[29,30]

The postgraduate FM training programme at the University of the Witwatersrand in SA has existed for more than 10 years. This study forms part of a broader convergent mixed-methods project evaluating the postgraduate FM training programme using the logic model. The logic model is a causal model based on the reductionist theory that links the inputs, activities or processes, outputs and outcomes.[31,32] The availability of resources influences the competencies that the registrar achieves during their training. This article reports on the 'inputs', namely FPs' and registrars' perceptions of the available resources for postgraduate FM training across decentralised sites affiliated with the University of the Witwatersrand.

Research method and design

Study design and setting

This qualitative study forms part of a broader instrumental case study evaluating postgraduate FM training programme using open coding. Case studies are useful for exploring phenomena using several data sources and data collection methods.[33] Instrumental case studies focus on gaining insight into an issue through an in-depth understanding of the case or cases included in the study,[34] making this approach suitable for researching workplace-based learning and teaching across different contexts.[35] The setting for the case study is the five decentralised training districts affiliated with the University of the Witwatersrand. Four districts (Ekurhuleni, Johannesburg Metro, Sedibeng and West Rand) are in Gauteng province, while the Dr Kenneth Kaunda district is in the North West province.

Postgraduate FM registrar training takes place in PHC clinics and community health centres in the district. Community health centres are 24 h facilities run by nurses and supported by general practitioners and FPs. Registrars (RGs) rotate for 2–3 months in the district or regional hospital departments. District hospitals are 50–300-bedded hospitals serving a defined population, providing 24 h comprehensive care services, mainly run by general practitioners with some general specialists, including FPs.[36]

The registrars undergo three years of training, including three weekly blocks per year of training at the university and the fourth year of elective rotations. Academic tutorials or skills are taught in groups or individually at regional training centres based in PHCs, community health centres or the district hospital. The trainer roles of FPs at the decentralised sites involve clinical training and supervision.

Clinical training includes discussions of clinical cases and conducting observed consultations and procedures. Academic supervision involves the supervision of assignments, research and various presentations.[37] The educational supervisory role includes mentoring the registrar, performing various summative and formative assessments and participating in the district training programme, as evidenced in the registrar's learning portfolio.[37]

Study population and sampling

The study population consisted of 20 FPs and 21 registrars in the training programme during 2020. There were two levels of purposive sampling. At the first level, FPs and registrars were purposively sampled[38] because they were best suited to provide in-depth perceptions of the available resources for postgraduate FM training. To ensure broad geographical representation, FPs and registrars from all five training sites were eligible for participation.

The second level of purposive sampling was aimed at FPs functioning in various roles, such as the head of department or unit at FM departments of districts, district education coordinators organising the training programmes and senior and junior FPs. The inclusion criteria for FPs were registration with the Health Professions Council of SA as specialists,[39] joint appointment by the Department of Health and the university and involvement in registrar training. The FPs recently qualified but not registered as specialists or FPs working as full-time staff at the university were excluded. All second- and third-year registrars were invited to participate in the study. Registrars in the first year of training were excluded as they would not have had adequate experience of the programme. The final sample consisted of 11 FPs and 11 registrars.

Data collection and analysis

Semistructured interviews were conducted with the 11 FPs and 11 registrars between March and August 2020. The interviews were initially intended to be face-to-face. However, only eight were conducted in-person because of the coronavirus disease 2019 (COVID-19) lockdown. The remaining 14 interviews were conducted virtually using Zoom (Zoom Video Communications, Inc., San Jose, California, United States of America) or Microsoft Teams (Microsoft Corporation, Redmond, Washington, United States of America). The researcher made field notes and used an interview guide (see Appendix 1). Each interview lasted from 80 min to 90 min. All interviews were audio-recorded and transcribed verbatim, and the transcripts were checked for fidelity.

The transcripts were analysed using the Braun and Clarke six-step approach of data familiarisation, coding, searching for the themes, naming and reviewing the themes and writing the report.[40] MAXQDA 2020 (Verbi Software, Berlin, Germany) was used to manage the analysis. The interviews with each group of participants were conducted while coding the transcripts and comparing and contrasting the codes and themes, as described by Tesch,[41] until no new codes and themes were identified, suggesting that data saturation[40] had been reached. Although no new themes were identified after nine interviews in each group of 20 and 21 participants, two more participants from each group were interviewed to promote data saturation. Extracts from participants' comments are identified using RG for registrar and FP for family physicians. The results of this study are presented in a thematic map. A thematic map is helpful for identifying themes, subthemes and interconnections between themes and subthemes.[40]

Several methods were used to improve the trustworthiness of the findings. The coding scheme was developed over several iterations of checking and rechecking by all authors, with their different areas of expertise, discussing the coding system until agreement was reached, improving intercoder reliability.[42,43] Reflexivity refers to how the researcher's role, their personal background and experiences potentially influence their interpretations of the data, thus shaping the direction of the study.[42] The first author was previously an academic coordinator at one of the decentralised sites, which means that she had first-hand knowledge of the registrar training programme. As a colleague of the FPs and supervisor of some registrars who participated in the study, the first

author continually reflected on issues like collegiality and power dynamics to avoid influencing the interviewees and the coding process. The first author's reflexivity was also augmented by keeping a record of the coding process and interpretations in MAXQDA for discussion with her co-authors. Such reflexivity raised her awareness and allowed her to mitigate potential biases in the study. Theme development and naming were cross-checked by the co-authors, who are experienced qualitative researchers, to enhance the credibility of the findings. Purposive sampling[38] of each group of participants and triangulating[44] the findings from the two groups, that is FPs and registrars, further improved the credibility of the findings. Detailed descriptions of the study methods enhanced the transferability of the study and keeping an audit trail improved the dependability, thus improving the trustworthiness of the study findings.

Ethical considerations

Ethical approval was obtained from the Human Research Ethics Committee (HREC Medical) of the University of the Witwatersrand (ref. no. M191140). Permission to conduct the study was obtained from the Gauteng and North West province district research committees. Informed written consent was obtained from study participants. The research was carried out following the Helsinki Declaration.

Results

The participants' characteristics are shown in Table 1. The FPs ranged in age from 41 to 60 years and had more than 5 years of registrar-training experience. Many FPs had attended short training courses, but none had any formal medical education training. The registrars' ages ranged from 30 to 60 years. Six were in their third year of study and five in the second year. All the registrars had some PHC experience before joining the programme.

The three themes and subthemes identified are represented in a thematic map (see Figure 1).

Impact of resource constraints

Most participants reported shortages of training tools, infrastructure, Internet availability and funding. Both groups of participants expressed the need for improved university support in recruiting more FPs to district training sites. They felt the university could improve support to address these shortages.

Equipment and infrastructure shortages

Both registrars and FPs commented on equipment challenges, including the shortage of mannikins. Some essential equipment were unavailable or nonfunctional. These prevented registrars from practising skills they learnt at the workplace:

> 'You don't have peak flows, you don't have ECGs [*electrocardiograms*], like those basic things that should be in a clinic you don't have, and then that makes it difficult in terms of your doing things on a daily practice. You know, like even your ophthalmoscope and otoscope, it's not like working, so you have to like [*to*] carry all your own equipment just to like examine a patient properly.' (RG 10)

TABLE 1: Training and experience of family physicians and registrars.

Family physicians	*n*	Registrars	*n*
Age		**Age**	
-	-	≤ 30	3
-	-	31–40	6
41–50	8	41–50	1
51–60	3	51–60	1
Years of training experience		**Year of training**	
1–5 years	3	Year 3	6
> 5 years	8	Year 2	5
Current position in the district		**Primary healthcare experience before joining the training**	
Family Physician – Grade 1	2	Community service doctor	4
Family Physician – Grade 2 (5 years' or more experience)	6	Worked for 3–5 years in clinics as a medical officer	3
Family Physician – Grade 3 (10 years' or more experience)	3	Worked less than 1 year in the clinics as a medical officer	2
Head of Unit or Acting Head of Unit of the district	4	Worked in an HIV clinic	1
Current district education coordinator	3	Worked in private practice	1
Previous district education coordinator	3	Primary healthcare patients seen at the district or regional hospital	1
Postgraduate qualifications other than Family Medicine (degree or diploma)		**Postgraduate qualifications other than Family Medicine before joining the programme (degree or diploma)**	
Yes	8	Yes	3
No	3	No	8
Postgraduate degree or diploma in medical education			
No	11	-	-
Yes	0	-	-
Medical education training courses attended			
Yes	9	-	-
No	2	-	-

HIV, human immunodeficiency virus.

Family physicians expressed their concerns about not receiving adequate equipment from the university while training in districts:

> 'In terms of learning materials, for example, whenever we need ECG, they don't give us that one, or sonar machine, or something that is helpful, or prepare anything of [*sic*] skill improvement or opportunities for [*the*] family physician. So, we do it voluntarily, even though there is not enough support.' (FP 2)

Both FPs and registrars identified several challenges regarding the limited training spaces, consultation rooms, projectors or laptop availability:

> 'It would be nice just to have some room that was dedicated to us from a certain hour … from hour to hour, it would be great. Because that's why we end up coming home on an academic day because I don't want to sit in a room where there's no desk and there's no … so DH [*district hospital*] 5 in the family medicine room there is no Wi-Fi … there's just no signal, so you are like in a cave.' (RG 11)

Family physicians and registrars expected more faculty support to optimise infrastructure at training sites and for joint appointees to access the tools needed for training:

> 'The university does not own any infrastructure here. And we will be glad if they can help [*with*] the infrastructure here.' (FP6)

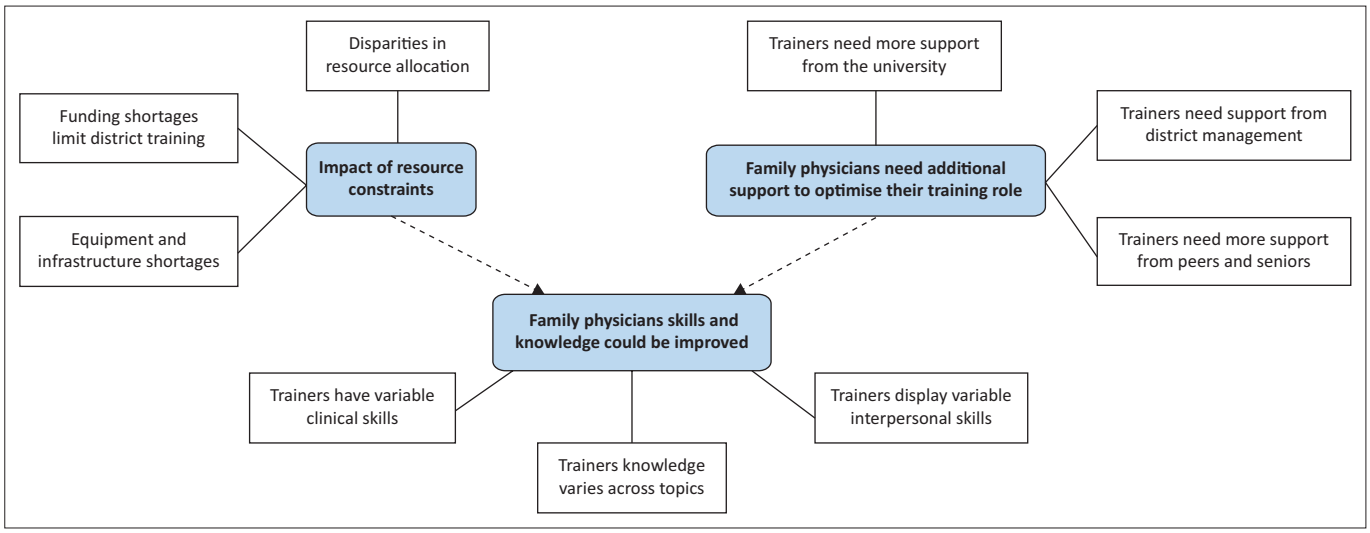

FIGURE 1: Thematic map.

> 'Even in terms of finance, in terms of competence, in terms of cell phone, in terms of any learning, we don't have support from the university.' (FP 2)

Variable Internet connectivity was a major challenge. Registrars regularly used the Internet in most districts, but in some districts, they were frustrated by the lack of consistent and stable online access:

> 'It's actually very interesting that you mention the Wi-Fi things because nowadays there's a lot to do online, the EML [*Essential Medicine List*] is available online and many other apps that one can use for their work. So ja, that's maybe something to start with, to have Wi-Fi available for practitioners to be able to use those tools.' (RG 6)

Most registrars and FPs felt that the university needed to address Internet availability at training sites:

> 'I think those like your internet, maybe the Wits University could organise that but at the district level, and that would be of help.' (RG4)

Some FPs mentioned a lack of communication from the university before the Internet installation in some districts, which limited its utilisation. According to them, the university should have consulted with district management before installing Internet connections to maximise its usefulness to registrars and medical students rotating at these sites:

> '[…*T*]hey put it [*Wi-Fi*] only in the district centre there, on the fourth floor. But where the students are. It's not … I mean, you have students coming here, but there's no Wi-Fi.' (FP1)

In contrast, FPs and registrars in a few districts felt that they had adequate equipment and infrastructure. Both groups of participants in those districts appreciated the availability of a well-equipped regional training centre with tools to support training activities:

> 'Yes, infrastructure – we have a nice regional training centre, and … it's opened a library now and there's access to computers, so, I think for the training site, yes, there's good infrastructure.' (RG8)

> 'Where we are, we've got instruments and things to help them to enhance learning. There are mannequins there, and then a lot of other things that are … we've got a library there where they can get books for family medicine, projectors, and all that.' (FP 8)

Funding shortages limit district training

Family physicians referred to insufficient funding support from the university and the district management, which meant that the Department of Health was responsible for most funding. Some FPs mentioned the inadequate clinical trainers' salaries or travel reimbursements but acknowledged that the university provided doctor's bags stocked with the necessary equipment at the training sites. Registrars pointed out that the district management provided limited funding for continuous medical education activities or workshops:

> 'You see, that's the problem, because the university does not pay anything. That's my understanding. And I think that is where the problem is with the [*provincial*] department. Because the Department [*of Health*] is paying everything, and I think Wits doesn't pay anything.' (FP 11)

Shortages of FP posts at many training sites negatively impacted the training. Family physicians expected the university to recruit more FPs to address this. Other FPs felt more full-time staff were needed for effective DCT:

> 'You do not supervise as should be the ideal situation because we don't have enough doctors, or family physicians to work alongside a registrar in the clinic.' (FP5)

> 'I was able to build it (FPs) up to five … but now you can't get additional posts.' (FP9)

> 'Permanent professors, we need people appointed full-time to make a difference.' (FP6)

Registrars indicated a lack of awareness of how the university or district management funds training in the districts:

> 'I'm not really sure about how the university funds the district regarding things.' (RG10)

In contrast, most registrars valued the university bursaries towards their tuition fees:

> 'And when it comes to the assistance we get with the bursaries, that's tremendous, that's big, that's a great assistance we get with the bursaries [*sic*].' (RG6)

Disparities in resource allocation

Many registrars felt that training opportunities differed across districts because of unequal resource allocations. According to them, the university may not be aware of differences in the resources available across sites:

> 'I doubt the university know[*s*] that what you learn in DT [*district*] 1 is totally different from what people are learning in DT3. So, I don't think they are involved, [*that*] they actually go and check what is it that you really do in DT1, what is it that you really do in DT 3, and what works in each and every district.' (RG2)

They felt that the university needed to advocate the standardisation of resources and training across the districts:

> 'So, you'll get more training depending on which district you are in … or you'll have more resources depending on which district you are in. For example, in DT1 we have the luxury of having many family physicians, whereas in another district they have two or three. So, if you're in that district, you are limited in terms of the amount of supervision and training you can get as opposed to another district which has more people available for supervision and training. And resources as well. Maybe some districts may have better resources, better equipment than others. So that should be standardised by the university, in my opinion, so that in [*sic*] every site, the registrars get the best out of the training.' (RG1)

Family physicians' skills and knowledge could be improved

Most trainers displayed good clinical knowledge and skills but required further training to improve the necessary skills for their training roles. According to most registrars, although FPs demonstrated good attitudes while engaging with registrars, their interpersonal skills could be improved.

Trainers' knowledge varies across topics

Most registrars felt that FPs had adequate knowledge, although this was dependent on previous clinical experience. Some registrars received more relevant information from junior FPs, because of their recent experience in registrar training, than from older FPs. The FPs also agreed that previous experience enhanced their knowledge, and training registrars forced them to keep their knowledge current:

> 'It has actually helped me to go back reading a lot, looking at [*the*] evidence, looking at the books, trying to get more information and credible and evidence-based information so that I would be able to teach the right thing.' (FP 3)

Trainers have variable clinical skills

Family physicians and registrars were of the view that FPs' clinical skills expertise varied. Some FPs displayed robust research and clinical-governance skills, whereas others were more skilled in clinical training. Most participants felt that the FPs usually demonstrated excellent skills in integrating FM principles and tools during training:

> 'I think it's a strength that I'm able to take them through how different resources, managing resources in a very constrained environment, as well as using all the family medicine tools, family-oriented care, doing family conferencing. So those are my strengths, practising the family practice tools have really been a good strength.' (FP10)

Most FPs felt there was room for improving their clinical skills and struggled to train registrars in skills that they were not regularly practising themselves:

> 'If you do not have your daily practice, then it's very difficult to keep your hand in and obviously more difficult to train.' (FP5)

Trainers display variable interpersonal skills

Both FPs and registrars said that FPs tried to maintain good interpersonal skills by engaging registrars, sometimes extending their concern to personal and family issues that could impact registrars' training:

> 'My strength is that … you see, from a distance, I'm able to pick up the difficulties that the registrars are having very quickly, which is something that I think I've kind of, like, grown over time.' (FP11)

> 'Sometimes [*we*] discuss any issues that I have, including academic, including personal. And if I have concerns or I have things that need to be sorted she would guide me where she can.' (RG9)

In contrast, some registrars felt that, in some instances, stronger interpersonal relationships were needed:

> 'Whereas with senior doctors, it's more about just work, work, work, work, work, work all the time, and you sort of don't relate because you're in different fields of life.' (RG1)

Family physicians need additional support to optimise their training role

While some FPs perceived a lack of support for their clinical trainer roles from the district management and university, others reported a lack of support from their peers and seniors. The FPs highlighted the advocacy role of the university to obtain support from the Department of Health to create FP posts and provide adequate training. Participants also expressed the view that the university should be more involved in district training by making more regular site support visits.

Trainers need more support from peers and seniors

Family physicians perceived that there was a lack of support from their peers or seniors for training in some districts. They wanted more peer mentoring, especially between junior and senior trainers:

> 'I think we're all just so busy and trying to keep our heads above water, that we don't always support the people around us. And I mean, it is a department where we've got young people coming through now and I think older people that aren't going to be

around for too much longer and they've got wonderful skills to impart, so I think clearer mentorship would be better.' (FP 7)

Some FPs felt that more equal workload distribution would reduce the possibility of FPs in some districts being overwhelmed by training:

'I often get lumped with kind of having to co-ordinate the whole programme and deliver it, which becomes quite heavy, and you also want other people's input and other people's brains.' (FP7)

There was also the view that senior supervisors did not provide the necessary support for training:

'You know, locally, the senior supervisor has a lot of issues using time for academic [*registrar training*]. You mustn't put it in your work schedule, so then now you end up using your private time to do academic activities, in terms of outside of the work.' (FP1)

Although most participants felt that FPs exhibited commendable passion and diligence in their teaching, many registrars were concerned about FPs not being accessible when needed because of the multiple roles and responsibilities they were managing simultaneously:

'As we do not see them a lot. I do think that one of the areas in our district that can do with some improvement is the fact that we do not see our family physicians as often as we would like to see them.' (RG8)

Trainers need more support from district management

Most participants were concerned that the district management did not fully understand and acknowledge the existence or value of the FM training programme, which negatively impacted the training:

'First of all, let's start from the recognition of the training programme. There needs to be clear recognition of the training programme. But that one is something which is … you are not even sure whether it's been recognised as something … as part of what is going on in the district.' (FP 11)

The lack of recognition of the programme could have contributed to registrars' perception of a lack of support or encouragement in performing FP roles, which negatively impacted registrar training:

'I don't think there's a real understanding of the point of family medicine and the point of family physicians and the role that we have to offer, in terms of mentorship and teaching students and really creating facilities to be academically inclined. I think from that point of view it's quite disheartening because I don't think they really see the role of family physicians.' (RG 10)

Trainers need more support from the university

Most FPs had strong views on the university's advocacy role of engaging with the provincial Department of Health to clarify and recognise the role of FM in the district:

'The only thing I would want the university to do more is more of getting directly involved with regards to negotiating with the district, with the Department of Health, for them to … because there is no way, there's no way most of these challenges with regards to synergy between the university and … within us and the district will be solved if the university doesn't come in the forefront. Because they should be the one that will go and explain to them that this is what we are all about; this is why we have this training complex here; this is why we have this training platform here, and all that, so they will understand better.' (FP 3)

Most FPs raised concerns about requiring more support for training and for their growth and development as trainers from the university. They felt isolated in the districts, with minimal involvement from the university:

'Well, I think the university, personally, for me, is they're just there to keep on passing the buck. People must just do the work. They don't … [*sighs*] the level of interest in terms of knowing, number one, if you are able to do the work, is not there.' (FP 1)

One registrar echoed the sentiment about the lack of university involvement:

'The university is not really involved in the district training programme, so there's not much support from the university in the district.' (RG1)

Many FPs requested more mentoring from faculty to develop as trainers:

'But I think, because we're affiliated to the … we've got joint appointment[*s*] with the university, I think we should have more structures, mentoring and growing [*sic*] for supervisors.' (FP6)

While some FPs acknowledged that existing courses offered by the university or other bodies supported their professional development, others wanted more courses to function optimally in their training and supervisory roles:

'I would love to be trained in other things, perhaps assessing exams, and go for some other training to improve myself to be able to be a better medical trainer.' (FP10)

Family physicians also expressed a need for the university to conduct faculty support visits at the sites to assess whether the training standard is appropriate:

'So, I think the university's part needs to be just that they need to come out and check and see whether the facilities actually meet the standard of training that the university expects.' (FP 11)

Discussion

This study explored South African FPs' and registrars' perceptions of the resources available in a decentralised postgraduate FM training programme. The findings contribute to the extant literature on the appropriate training of doctors to equip them to meet communities' healthcare needs. Most of the FPs who took part had several years of experience and had occupied various roles in the programme, contributing to the robustness of the findings:

Adequate resources are fundamental to improving postgraduate training. Most participants had experienced severe resource shortages across all five training districts, relating to equipment, infrastructure, funding and Internet connectivity. A well-equipped training complex is a

fundamental requirement to promote successful learning.[13,14,15] Although previous studies have reported inadequate material resources at DCT sites in sub-Saharan Africa,[23,24,25,29] they did not explore individual resources such as equipment, Internet access, infrastructure and funding options available for training and trainer support in postgraduate training, as this study did.

The lack of equipment, mannikins and Internet access hindered the registrars from practising their learnt skills. For example, comprehensive chronic care of a hypertensive and diabetic patient includes a complete eye and foot exam and an ECG as part of an annual check-up. The lack or nonfunctionality of basic equipment like ophthalmoscopes, ECG machines or monofilaments hindered training in most districts. Although the primary responsibility for equipment availability lies with facility managers who are part of the district management, the university needs to ensure the training standards at these facilities. The availability of adequate equipment impacts the standards of care provided to patients attended by registrars during training. Registrars' ability to access the latest management guidelines for any clinical condition, which forms part of their learning, requires Internet access at their workplace, which was constrained at these sites. Previous studies reported that registrars mainly depended on their clinical knowledge at PHC facilities because of the unavailability of point-of-care tests.[25] The availability of point-of-care tests depends on ideal clinic standards[45] but is still inadequate to achieve adequate skills and competencies for registrars at PHC facilities. The provincial departments of health, Wits University and district management could play an advocacy role to address these resource shortages to improve registrar training, thus improving the standard of PHC services they provide in the communities. There should be minimum prescribed standards, including resources for accreditation of the district training sites by the Health Professions Council of SA in postgraduate DCT, as required for undergraduate training. Districts and universities will then be compelled to equip training sites with the resources needed to maintain training standards.

While adequate resources are fundamental, skilled trainers are vital for effective postgraduate training. The FPs displayed variable personal attributes and physician, teacher and personal characteristics, in contrast to what is ideal as described in previous studies,[17,18,20] suggesting a need for further improvement. The trainers demonstrated varying levels of clinical knowledge and clinical-reasoning skills across topics. Most FPs could engage and mentor registrars during their trainer–trainee relationships, even on personal issues when necessary, an essential attribute for clinical training.[21,22] Better communication skills could enhance the trainer–trainee relationship, especially with senior trainers, as mentioned by some registrars. The issue of FPs' lack of availability and accessibility was regarded as an example of ineffective supervisory behaviour,[46] which could be attributed to their multiple roles and responsibilities, as seen in other studies.[37,47]

Many FPs struggled to train registrars on clinical skills that they did not practise regularly, indicating a need for ongoing training opportunities to maintain and update their skills. While some FPs were based at community healthcare clinics or PHC clinics, others were based at the district hospital, which could explain the differences in their skill levels. Family physicians also said they needed the university to provide and maintain a supportive environment to update their training and supervisory skills. However, FPs agreed that attending training courses organised by the SA Academy of FPs helped them grow better as trainers. More training opportunities to strengthen the trainer role can be made available as workshops, short courses or tool kits, as in high-income countries.[16,48,49,50] Different teaching models[19] developed in high-income countries have been adapted to train FPs in decentralised clinical settings. Most trainers had attended courses conducted by the SA Academy of FPs or the university, but more consistent training is preferable to once-off training sessions. Peer mentoring or co-teaching on teaching, assessment, feedback, interpersonal skills and supervisory behaviours as critical skills for effective training and supervision[46] by more experienced trainers could be another strategy. These skills were perceived as insufficient among FP trainers in this study.

The lack of teamwork, task sharing and understanding of each other's roles were concerns expressed by both FPs and registrars. The need for robust support among peers, seniors and supervisors is vital for sustainable DCT. While other studies described successful teamwork in a few SA training districts,[37,51] the teamwork at the study sites needs to be strengthened. The exchanging and sharing of knowledge and skills between peers, especially when some have good supervisory skills in research and clinical governance and others are more skilled in training on common clinical conditions, could enhance training. This shift in the clinical trainers' mindset in taking responsibility for training with innovative ways of collaboration will significantly strengthen the DCT sites.

Even where adequate resources and skilled trainers are present, support from high-level stakeholders is essential for the successful implementation of training programmes. Most participants were concerned about the lack of support from provincial health and district management departments for FM training. Perceived poor support negatively impacted FP and registrars' training roles and responsibilities. The findings were similar to previous studies done in high-income countries[6,16] and sub-Saharan Africa.[3,8,52] Postgraduate FM training is well established in many SA universities, leading to other African countries developing their training programmes. The poor health system support has been highlighted previously,[8,29] but the situation remains largely unchanged, as this study also suggests. As more doctors are joining this discipline, greater attention is required to strengthen support from various key stakeholders. Family physicians, when qualified, are based in district health systems to work, train and lead the PHC team, supporting primary-care nurse practitioners, general practitioners and other health-worker cadres, improving the quality of patient care.[53,54]

The multiple responsibilities of FPs jointly appointed by the district and university may negatively impact the effectiveness of clinical trainer role, as described elsewhere.[29] Better clarification of the role of the trainer by the district and university will help meet expectations on training standards, as found in other SA universities.[25,30] Building relationships between relevant stakeholders (such as national and provincial health departments, the university and district management) was vital, according to most participants. The overall advocacy role of the university to lead DCT by regular engagement between all stakeholders was highlighted. Enacting these advocacy roles by the university could help clear ambivalence regarding FP training and roles that still existed in academic and political circles.[52,53]

Regular FP engagement by the university or the Academy of FPs and capacitating them for training and supervision, rather than once-off attending training courses, will act as enablers in trainer roles. A 'see one, do one and teach one'[55] approach may not work in training and supervisory roles. Although it is expected at times, trainers need constant mentoring and support to perform their training roles effectively. Formative assessment site visits by the SA Academy of FPs as a follow-up after clinical trainers have attended courses could augment clinical trainers' confidence. Previous studies also suggested the need for ongoing support for clinical trainers involved in DCT.[56] Regular support visits to these decentralised sites by the university were vital, as suggested by participants. This could assist in achieving expected training standards and acquiring resources.[57] Family physicians and registrars suggested recruiting more full-time trainers by the university to strengthen DCT. The FP trainers, if newly recruited, should be based anywhere in the district health system, either in PHC or district hospitals, rather than at the regional or tertiary hospitals or the university, acquiring more hands-on patient care experience, capacitating them to develop as clinical trainers.

Another strategy for better university support for DCT could be regular engagement between the university and the FM division, on the joint staff roles, and sharing small successes achieved in DCT, which could improve understanding of FM as a discipline and the FP roles at the university level. Such understanding may result in additional university support, consequently prioritising more funding and resource provision. Available district funds could be used efficiently with added university support to develop successful training sites. For example, the availability of a sonar machine at a community healthcare facility augments the training and transformative learning experience of registrars while they perform an ultrasound on real patients. Registrars can achieve superior competency levels by repeatedly practising these core skills under FP supervision. Registrars can also teach this skill to medical students rotating in PHC contexts, allowing them to practise teaching skills in an authentic context.

Family physicians are expected to demonstrate leadership and governance as key competencies in their various roles.[54] The feeling of powerlessness among FPs and registrars in this study could be mitigated by FPs advocating for an improved understanding of the discipline by district managers and the provincial health departments. Family physicians should assume more active roles in engaging the university and district management about the potential impact of resource shortages on registrar training and, ultimately, on community healthcare. For example, FPs should engage facility managers at PHC level, where most of the training is conducted.[57] This type of engagement could mitigate the lack of knowledge and understanding that could underpin inadequate support for registrar training. The district and university heads of department should support FPs in engaging district managers at various levels in raising stakeholder awareness about the necessity of adequate resource provision for effective registrar training.

Limitations

Being an inside researcher has benefits and risks, especially when evaluating your institution.[58] The principal author conducting the interviews may have influenced the responses of fellow FPs and the registrars she supervises in the district where she works. However, as explained, steps were taken to mitigate this. The researcher may have missed nonverbal cues in the virtual interviews, but this was unavoidable during the COVID-19 lockdown.

Recommendations

The university advocacy and FP leadership roles could improve the provincial health department and district managers' understanding of the value of FM training. Successful and sustainable decentralised postgraduate FM training programmes need adequate key stakeholder engagement, accelerating availability of adequate resources and skilled staff. Regular faculty support visits to support clinical trainers and standardisation of training and trainer roles across training sites is an area needing emphasis. However, faculty development through constant engagement with FP supervisors for effective trainer and supervisor roles and regular formative assessment visits to training sites is essential.

Family physicians should integrate training with service delivery instead of visualising them as separate entities. The FP leadership role assists in accessing sufficient resources for optimal training opportunities. Family physicians also need to offer peer mentoring and work as a team to enhance training and supervision creating ideal decentralised training complexes.

Conclusion

This study aimed to explore FPs' and registrars' perceptions of the available resources in a decentralised postgraduate FM training programme. Improved resource provision and clinical trainer support positively influence trainer roles, impacting decentralised postgraduate FM training in district health systems. In a middle-income country like South Africa,

adequate clinical trainer support helps to develop registrars into newly qualified FPs, who can better respond to the healthcare needs of communities. These findings could be of value in similar settings elsewhere.

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Competing interests

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Authors' contributions

N.J.E. conceptualised the research, collected and analysed the data and wrote the first manuscript draft. N.J.E., A.Z.G. and L.J. contributed to the data analysis, developing the themes and writing the subsequent drafts. All authors contributed to the development of the manuscript and approved the final version of the manuscript.

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Data availability

Data are available upon reasonable request from the corresponding author.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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Appendix starts on the next page →

Appendix 1

TABLE1-A1: Interview guide

Family physician	Registrar
What do you think about your skills as a clinical trainer and supervisor?	What do you think about the skills of your family physician as a clinical trainer and supervisor?
What do you think are the strengths and challenges in your role as a clinical trainer and supervisor?	What do you think are the strengths and challenges in the family physician role as a clinical trainer and supervisor?
Do you think you have adequate support from the university to improve your skills as a clinical trainer or supervisor? If you think 'yes' or 'no', please explain further	-
What do you think about the support from district management for training at your district?	What do you think about the support from district management for training at your district?
Do you think there is adequate support from the district concerning:	Do you think there is adequate support from the district concerning:
a. Equipment (if you think ' yes' or 'no', please explain further)	a Equipment (if you think ' yes' or 'no', please explain further)
b. Infrastructure (if you think ' yes' or 'no', please explain further)	b. Infrastructure (if you think ' yes' or 'no', please explain further)
c. Wi-Fi-internet access (if you think ' yes' or 'no', please explain further)	c. Wi-Fi-internet access (if you think ' yes' or 'no', please explain further)
d. Funding (if you think ' yes' or 'no', please explain further)	d. Funding (if you think ' yes' or 'no', please explain further)
Do you think there are any other challenges on support for training in your district?	Do you think there are any other challenges on support for training in your district?
What do you think about the support from the university for the training at your district?	What do you think about the support from the university for the training at your district?
Do you think there is adequate support from the university concerning	Do you think there is adequate support from the university concerning
a. Equipment (if you think ' yes' or 'no', please explain further)	a. Equipment (if you think ' yes' or 'no', please explain further)
b. Infrastructure (if you think,' yes' or 'no' please explain further)	b. Infrastructure (if you think ' yes' or 'no', please explain further)
c. Wi-Fi-internet access (if you think ' yes' or 'no', please explain further)	c. Wi-Fi-internet access (if you think ' yes' or 'no', please explain further)
d. Funding (if you think ' yes' or 'no', please explain further)	d. Funding (if you think ' yes' or 'no', please explain further)

CHAPTER 5. PERCEPTIONS OF POSTGRADUATE FAMILY MEDICINE SUPERVISION AT DECENTRALISED TRAINING SITES, SOUTH AFRICA

"Supervision is an integral part of clinical activity, not separate from it and the purpose is to ensure patient safety and promote professional development or learning." Sue Kilminster (2010)

5.1. INTRODUCTION

This original research article presented in this chapter was published in the **African Journal of Primary Health Care & Family Medicine** as follows.

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This article presents the participant's perceptions of supervision in the postgraduate family medicine decentralised training programme, a 'process' in the logic model evaluated in this study.

I presented this research at the South African Academy of Family Physicians 23rd National Congress, hosted virtually from Cape Town, South Africa, in August 2021.

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Perceptions of postgraduate family medicine supervision at decentralised training sites, South Africa

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Background: Specialist training in family medicine (FM) is growing rapidly in sub-Saharan Africa. The strong emphasis on workplace-based learning for speciality training makes it vital to gain in-depth insights into registrar supervision. Previous studies have explored aspects of supervision at decentralised sites in high-income countries, however, little is known about the benefits and constraints of decentralised postgraduate supervision in low- to middle-income countries, especially in Africa.

Aim: This study aimed to explore family physicians' and registrars' perceptions of the strengths and challenges of clinical and educational supervision across decentralised training sites.

Setting: The study was conducted across two provinces at five decentralised training sites affiliated with the University of the Witwatersrand, Johannesburg.

Methods: This qualitative study involved semi-structured interviews with a purposive sample of 11 FPs and 11 registrars. The data were thematically analysed.

Results: Two of the four themes identified, 'supervision is context-specific and supervisor-dependent', and 'the nature of engagement matters', involved strengths and challenges. The other two, 'supervision is not ideal' and 'the training environment is challenging', focussed on challenges.

Conclusion: Supervisors and registrars described the postgraduate FM supervision as context-specific and supervisor-dependent. Supervisors displayed good clinical-teacher characteristics and supervisory relationships. However, several challenges, including registrars' workload, resource shortages and a lack of standardisation across training sites, need to be addressed. Regular faculty development is essential for supervisors to be aware of relevant aspects of, and current trends in, postgraduate training.

Keywords: clinical supervision; decentralised clinical training; educational supervision; family physician; family medicine registrar; postgraduate training; workplace-based learning.

Background

In 2013, the World Health Organization advocated expanding health professionals' training from academic centres to decentralised training platforms in order to address communities, and nations' priority health concerns.[1,2] Decentralised clinical training (DCT) refers to training at sites away from tertiary centres for six months or more in the context of primary healthcare (PHC) clinics, community, district or regional hospitals, or general practice settings.[3] While DCT is well established in high-income countries (HIC), such as Australia, the United Kingdom and Canada,[4] it is a relatively new concept in low- and middle-income countries (LMIC), such as South Africa (SA) and other sub-Saharan nations.[3,4,5,6] Decentralised clinical training offers trainees more hands-on experience of clinical and procedural skills during longer longitudinal rotations. It also provides flexible curricula typical of postgraduate medical training.[3,7] Despite these affordances, DCT is affected by factors more likely to prevail in LMIC, including a lack of resources and comprehensive support. Training at DCT sites has been shown to improve healthcare provision across communities; however, DCT needs to be optimised in order to ensure that the priority health concerns of LMIC are met.[3,4,8,9]

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Supervision of postgraduate trainees is a vital component of DCT, which involves workplace-based learning (WBL). Workplace-based learning is driven by the needs of the workplace, allowing trainees access to training and development while fulfilling other roles and responsibilities.[10] Workplace-based learning prioritises informal learning opportunities, maximising cognitive apprenticeship models,[11] role modelling,[12] communities of practice[13] and situated learning.[10,14] Situated learning refers to the learning that occurs by participation in and collaboration with other professionals in a community of practice.[14] The informal learning opportunities associated with WBL are less valued than formal training sessions, as they are regarded as disorganised, opportunistic and lacking in formal educational rigour or structure.[10,15,16] Despite the negative view of informal training, the informal training opportunities in WBL make possible various postgraduate training methods, all of which emphasise the importance of the adequate training and supervision of trainees in the workplace.[16,17] These methods include supervised participation in practice, including entrustment and support-seeking; mutual observation of practice, including monitoring and modelling; and dialogue during practice, including meaning-making and feedback.[12] Despite the vital role of supervision in DCT, existing studies have not explored the informal learning opportunities in WBL adequately in the context of LMIC.

There are two types of supervision in WBL. Educational supervision occurs in recognised training contexts, while clinical supervision is less formal and occurs at the patient bedside or in the primary care context.[18] Educational supervision involves establishing trainees' learning needs and reviewing their progress, identifying educational opportunities and compiling learning portfolios.[18,19] The role of an educational supervisor focuses on developing a good relationship with trainees and facilitating their professional, personal and educational progress, including being a good listener, assessing trainees' current knowledge, skills and attitudes, and providing feedback.[19] The role of a clinical supervisor includes providing supervision tailored to trainee competence and experience,[16] being available to trainees, providing regular feedback and responding timely to their learning needs.[20] The encounters of clinical supervision range from daily developmental conversations[20] on clinical management to reflective case-based discussions in hospital wards or clinics.[18]

Effective supervision in the workplace is a multi-faceted concept requiring training on beneficial teacher characteristics and appropriate role-model behaviour. Supervisors should display excellent clinical knowledge and skills, professionalism[21,22] and teamwork, and encourage students to reflect on their practice and balance their time and professional and personal lives.[12,23,24,25] Supervisors should know what constitutes a good supervisor–trainee relationship, that is, showing evidence of a bond, trust, agreement of supervisory goals and openness.[26] Supervision requires supervisors to have current knowledge and continually improve their clinical reasoning in the context of challenging heavy clinical workloads.[26,27] These supervisor characteristics also provide trainees with opportunities for self-reflection,[26] which is essential for the self-regulated learning required during WBL.[28]

Postgraduate family medicine (FM) training at DCT sites in African countries is in varying phases of development.[9,29,30,31] Family medicine was recognised as a speciality in SA in 2007.[32] Before this, many other African countries (like Uganda and Kenya) had established academic FM decentralised-training complexes to strengthen their PHC services.[9,33,34] However long FM training has been taking place in these countries, there is a critical need for trained and competent family physicians (FPs) to service these training complexes. Despite the roles of FPs and the training outcomes in sub-Saharan Africa having been identified,[9,35,36,37] Family medicine training is disadvantaged by a lack of a shared understanding of FM on the part of stakeholders (general practitioners, specialists and policymakers), FP shortages, a lack of existing policies and inadequate funding.[4,9,38]

Decentralised FM training in SA differs from training in HIC. While FM training in HIC occurs in private general practice settings,[39,40,41] in SA, registrar training (training for South African, postgraduate, medical trainees) is mainly rotational across PHC clinics and public hospitals. At these sites, FPs, specialists and registrars in some clinical departments and medical officers (MO) who have had no formal training in supervision play a critical role in training students, interns and junior doctors.[42,43] The public-service setting of FM training in SA aggravates difficulties associated with supervision. The challenges include a lack of meaningful feedback or direct clinical contact as part of career progression by some supervisors and heavy clinical and academic workloads for supervisors.[7,44,45] Some of the strengths of DCT in SA, as identified in previous studies, include the characteristics of the learning environment, supervisors' competence and teaching styles, the use of learning portfolios, the quantity and quality of learning conversations, and opportunities for role modelling.[44,45]

At the University of the Witwatersrand (Wits University), one of nine South African universities offering a 3-year full-time postgraduate FM programme, the DCT sites are spread over five districts in two provinces. Registrar training in these districts takes place in both clinical and non-clinical contexts. The clinical context comprises the peri-urban or rural PHC or community health centre or district and regional hospitals, depending on the district. Community health centres are 24-h nurse-run and doctor-supported facilities. District hospitals or level-1 hospitals are categorised into small, medium or large depending on the number of beds, with limited specialist medical services and serviced by MO and FPs.[46] Regional hospitals are larger hospitals (200–800 beds), providing 24-h services offering specialist services across various disciplines.[46] The non-clinical context refers to district regional training centres (RTC) based within clinics or district hospitals.

Given the potential for DCT to improve healthcare provision and medical education in SA, there is a lack of in-depth exploration of supervision, supervisory roles and the supervisor–trainee context interactions in sub-Saharan Africa. The purpose of this study was to explore FPs' and registrars' perceptions of the strengths and challenges of postgraduate supervision in clinical and non-clinical contexts at Wits University. These findings could contribute to a more effective and standardised local programme that could benefit other universities nationally and in other sub-Saharan African countries.

Methods

Study design and setting

The reported study forms the qualitative component of a broader convergent mixed-methods evaluation of the postgraduate FM, decentralised-training programme at Wits University. The intent of convergent mixed-methods designs is to integrate qualitative and quantitative data in order to enhance understanding of a phenomenon of interest.[47] The qualitative component of the study used an inductive interpretative approach[48] to explore FM supervisors' and registrars' perceptions of postgraduate supervision in the FM, decentralised-training programme. These groups of interviewees were purposively sampled because they possessed the characteristics being sought and could provide an in-depth understanding of the phenomenon of interest.[49]

Four of the operational districts – Ekurhuleni, Johannesburg Metro, Sedibeng and the West Rand – are situated in Gauteng province, with the Dr Kenneth Kaunda district located in the North West province. Family physicians responsible for supervising the registrars at the clinics and the RTC will be referred to as *FP supervisors*. Any non-FM doctor who supervises the registrar during hospital rotations is referred to as *non-FP supervisors*. *Non-FP supervisors* include specialists, registrars and senior MO in other clinical departments. The different types of supervision include case discussion between a supervisor and registrar about a patient in the consulting room or ward, facilitating presentations at RTC or clinics and leading discussions of learning portfolios with registrars. *Adequacy of supervision* refers to the extent to which supervisors fulfil the above requirements. Family physician supervisors perform as both clinical and educational supervisors in some districts, whereas in others, there is some differentiation in their roles. Non-FP supervisors participate in the supervision of the registrars on case discussions during ward rounds or while performing procedures or clinical presentations at hospitals.

Study population and sampling

This study involved purposive sampling[49] of FPs and FM registrars to achieve representativeness across the five training districts. The study population consisted of 20 FPs and 21 registrars. All FPs involved in registrar supervision in the five districts were eligible to participate in the study. Family Physicians who were not jointly appointed by the Department of Health and Wits University were excluded. Only registrars in their second and third years of training were invited to participate in the study. First-year registrars were excluded from the study as they were deemed not to have adequate experience of the training programme. Of the 11 FPs and 11 registrars interviewed, three FPs and three registrars were from one district, and two FPs and two registrars were from each of the other four districts.

Data collection

Semi-structured interviews were conducted with the FPs and registrars between March and August 2020. Although initially intended to be face to face, the COVID-19 lockdown necessitated that most of the interviews (14/22) were conducted electronically using Zoom or Microsoft Teams. The interviews, which lasted for about 80–90 min, were conducted in English by the principal researcher and were audio-recorded. The FPs and registrars were asked how they supervised and were supervised, respectively, across the different training sites, and about the strengths and challenges of supervision (see Appendix 1, Interview guide). Interviews were conducted until saturation was reached and there were no new emerging themes.[50]

Data analysis

The interview recordings were transcribed verbatim and analysed thematically using Braun and Clarke's six-step approach.[51] The analysis was managed in the qualitative data analysis software programme MAXQDA version 2020. After checking the fidelity of the transcripts against the recordings, the principal researcher familiarised herself with the data through several readings of the transcripts (step 1) and used open coding to develop a coding system (step 2). The initial codes were grouped into subcategories, which were then grouped into categories. Similar categories were merged into sub-themes, and then into themes (step 3) through an iterative process of consultation with the co-authors of this study. As part of the iterative process of analysing the data for patterns, we reviewed the themes (step 4) and defined them (step 5). The final step (step 6) involved writing the paper using appropriate excerpts from the data to validate the themes.

Trustworthiness

The credibility of the study was improved through the iterative processes of coding the data and refining the codes and categories in collaboration with the co-authors, including the identification and naming of themes. Purposive sampling[49] and data triangulation[52] from different sets of participants, including FPs and registrars from all decentralised sites, further enhanced credibility. A detailed description of the study methods, including the sampling, inclusion and exclusion criteria, improved the transferability of the findings. An audit trail[52] of the data management and the development of the codes, categories and themes enhanced the dependability of the study. All three authors were constantly examining and exploring perceptions of the

postgraduate FM training programme, thereby augmenting confirmability.

Ethical considerations

Ethics approval was obtained from the Human Research Ethics Committee (HREC Medical) of the University of the Witwatersrand (certificate number: M191140). In addition, permission to conduct the study was obtained from the Gauteng and North West province district research committees using the National Health Research Database (GP_201910_050). Informed consent was obtained from all participants. The research study was carried out following the Helsinki Declaration.

Results

The characteristics of the study participants are shown in Table 1. Of the 11 FPs (FP1 – FP11), eight had more than five years of training experience and three had less than five years. Among the 11 registrars (RG 1 – RG 11) who participated, five were in their second-year and six in the third-year of training.

While most FPs attended short courses, none of them had formal training in medical education. All the registrars had some level of PHC experience before joining the programme.

The findings from analysis of the perceptions of supervision by FPs and registrars were organised into four themes and 12 subthemes, as shown in Table 2. Two of the four themes, 'supervision is context-specific and supervisor-dependent' and 'the nature of engagement matters', included both strengths and challenges. The other two, 'supervision is not ideal' and 'the training environment is challenging', highlighted the challenges.

TABLE 1: Participant characteristics.

Characteristics	*n*
Registrars	
Age (years)	
≤ 30	3
31–40	6
41–50	1
51–60	1
Gender	
Male	5
Female	6
Nationality	
South Africa	7
Not South Africa	4
Year of training	
Year 3	6
Year 2	5
Family physicians	
Age (years)	
41–50	8
51–60	3
Gender	
Male	7
Female	4
Nationality	
South Africa	5
Not South Africa	6
Years of training experience	
1–5	3
> 5	8

Supervision is context-specific and supervisor-dependent

The FPs and registrars perceived supervision to be specific to the context in which registrars are supervised with unique strengths and challenges in both clinical and non-clinical settings.

Family physician supervision in the clinical context enables individual attention

Most registrars valued personal contact with FPs in clinics and district hospitals. Registrars and FPs provided several examples of the types of one-on-one engagement possible when working in the same environment, such as seeing patients together and FPs observing registrars conducting consultations, which allowed them to identify learning needs. One of the registrars pointed out that a case discussion would always ensue regardless of the FP supervisor:

> 'We see patients together, or where I will maybe interview a patient or she will see the patient, or I will see the patient, and we discuss the case together.' (RG 9)

In some districts, working in the same environment allowed supervisors to model the procedures involved when conducting consultations. In other districts, FPs and registrars did not have one-on-one engagements; they consulted separately but discussed complex cases of patients when required:

> 'So, you'll be seeing your patient in your own room, he might have his own room, and then if you are stuck and you have a question, then you'll go to him and ask'. (RG 4)

The most critical aspects of one-on-one engagement involve providing registrars with meaningful feedback on observed consultations, procedures and skills using the mini-clinical evaluation exercise and direct observation of procedural skill

TABLE 2: Themes and subthemes.

Themes	Sub-themes
Supervision is context specific and supervisor dependent	FP supervision in the clinical context enables individual attention
	FP supervision in the non-clinical context provides multiple perspectives
	Non-FP supervision focuses only on the clinical training
The nature of engagement matters	Engagement is tailored to learning needs
	Supervisor characteristics impact the training
	Professionalism affects engagement
Supervision is not ideal	Time constraints among FPs
	Registrars often feel unsupervised
	Supervision is not standardised across the training sites
The training environment is challenging	Insufficient resources hinder training
	Work–life balance is challenging for registrars
	The district hospitals are perceived as hostile

FP, Family physicians.

templates when carrying out workplace-based assessments at clinics. According to some FPs, workplace-based assessments aligned with the national examination standards, and feedback was provided accordingly. The extent of the feedback depended on the type of patient. Family physician 3 explained that some patients 'stimulate us to go deeper and then talk (about) a lot of things with regards to diagnosis, management, theoretical things and all that'.

Some registrars, while on regional or district hospital rotations, valued individual engagements during supervisory visits by FPs. Family physicians and registrars referred to different types of FP–supervisor engagement in some districts, including conducting ward rounds and seeing patients together with registrars and case-based discussions. According to some registrars, these supervisory visits helped them to focus on more relevant skills during their rotations. At the same time, FPs described how these visits allowed them to get feedback on registrars' progress or any issues that needed to be brought to their attention from heads of departments:

> 'If there are any issues that the supervisors have raised, which has happened before, for instance, the supervisor can say, look, this person we don't see … their attendance has been very poor, and all those kind of things, then we take it along those lines.' (FP 11)

In districts where FP supervisors did not visit the registrars in the hospitals, FPs only received feedback from registrars about their progress during the weekly academic sessions at RTC. Unfortunately, this limited feedback denied registrars the opportunity to engage with FPs in their learning setting during rotations. Even though some registrars described meaningful individual engagements, others raised concerns over the quality of supervision, depending on the extent of the supervisors' level of experience and their approach to teaching. For example, one registrar said:

> 'How rich is the discussion? It's very subjective [*and*] it's also supervisor-dependent. We gain a lot from different supervisors, but it depends actually on the person who's supervising that day.' (RG 6)

Family physician supervision in the non-clinical context provides multiple perspectives

Registrars and FPs highlighted the benefits of multiple engagements and receiving input from different FPs during their RTC academic sessions. The diversity of engagements and input allowed the registrars to receive varied information, opinions and strategies from multiple FPs. According to some registrars, different supervisors focused on different areas in their feedback and had various areas of interest and expertise, which added to the robust discussions:

> 'There is some benefit with having multiple opinions, and then you are able to formulate what works best for you as an individual based on different experiences that is [*sic*] shared with you'. (RG 1)

A few FPs felt that receiving feedback from more than one supervisor enabled more robust discussions compared with individual engagement at the clinics:

> 'What we do at DT [*district*] 4 [*is that*] we supervise them collectively. I do it with another family physician and sometimes with two other family physicians, so we try as much as possible to give our individual input[*s*].' (FP 4)

Non-family physician supervision focuses only on the clinical training

Non-FP supervision was conducted by either consultant specialists or senior registrars rotating from the university or senior or junior MO in various clinical departments. Despite this variation, both FPs and registrars valued the various clinical-training activities, which included case-based discussions, tutorials and academic sessions:

> 'You basically, like if you want to discuss the patient, you go to the consultant and discuss the case, and then the consultant will advise you or come see the patient with you and discuss what needs to be done, or it will be senior registrar would come through and also like observe and examine with you. So, from that point of view you get some supervision'. (RG 10)

According to some registrars, they were invited to observe procedures or skills whenever their supervisors performed them and were allowed to practise skills repeatedly under guidance in order to achieve the expected level of competence:

> 'So that's what we agreed with them, so whoever is doing calls that day, even when I'm in OPD [*out-patient department*], if there is a procedure that needs to be done, and it's on my objectives list, so I'll get them to call me, I'll go and check and see how they do it, or either I do [*it*] and then they will show me how to do it'. (RG 4)

Both participant groups perceived the nature and frequency of non-FP supervision at regional and district hospital rotations as department-dependent, variable and needing improvement regarding the extent of their involvement in training. In addition, one of the registrars perceived the lack of consultant as problematic:

> 'Sometimes, when we do rotate in some of the clinical departments, not all of them have a consultant. Sometimes we find medical officers; some of them may be junior to some of us in those departments. So, it's not all the time that we have the availability of consultants.' (RG 5)

Despite the lack of consultants, a few FPs and registrars felt that supervision by consultants visiting from regional hospitals to district hospitals was also problematic because they were not available for outreach visits. Most registrars and FPs thought that non-FP supervisors lacked an understanding of the expectations, scope of practice and learning outcomes of FM. One of the FPs commented:

> 'I'm not always certain that the specialists there are really aware of what is expected of these students, and I know that they always say they're not becoming mini-orthopods or mini-psychiatrists'. (FP 5)

Some registrars felt that non-FP supervisor discussions with registrars were more aligned with that speciality's clinical approach, as opposed to the biopsychosocial approach of the discipline of FM. For example, one of the registrars (RG 1) commented, '[*s*]ometimes when you're doing rotations it

becomes too clinical and the biopsychosocial [*approach*] – it's, sort of, left out'.

Registrars and FPs felt that registrars were often treated like interns or MO. They could be expected to perform tasks such as taking blood or were regarded as extra workforce, which prevented them from focusing on their learning needs:

> 'Most of the time, they'll be asking, "[*w*]hat is (a) family physician?" So, it's similar in most specialities. They, so far, don't know exactly what is (a) family physician (and) what is expected from them to teach registrars in Family Medicine'. (RG 4)

The nature of engagement matters

Several strengths and a few challenges that affected the nature of the engagement between registrars and FPs were identified. Firstly, the nature of engagement by FPs in clinical and non-clinical contexts is closely linked to the registrars' learning needs. Secondly, it allows integration of the FM principles and approaches into their learning. Other subthemes mentioned included supervisors' attitudes, the benefits of teamwork and registrars' level of professionalism.

Engagement is tailored to learning needs

During FP supervisor engagement, both FPs and registrars identified that training was strongly linked to the registrars' learning needs and gaps:

> 'So you'll have to discuss with your supervisor what you know, what you don't know, what your learning needs are, [*and*] what gaps need to be filled to make you adequate or competent as a physician.' (RG 1)

FPs felt that they assisted registrars in identifying their learning needs:

> 'The training here is supposed to be self-directed learning based on their identified need. So, we try to give them that ability to identify what is their learning need when they go to, let's say, like immunisation, well-baby clinic, antenatal clinic, and all that'. (FP 11)

Supervisor characteristics impact the training

Most registrars perceived that FP supervisors provided them with insights into patients' comprehensive and holistic care in clinical and non-clinical contexts as commented by RG 7, '[*e*]ven just the way that they assess us gives us an insight into what is expected of us, as family physicians and in the examination'.

Supervisors improved the registrars' biopsychosocial approach and clinical reasoning and bolstered their confidence in consultations during clinic sessions.

Family physicians felt that they were training registrars for the clinical role and community-oriented primary care, training students or nurses, and clinical governance roles. They kept track of whether registrars would be good FPs by observing patient interactions, examination skills, referral patterns, prescriptions, clinical record-keeping and professional behaviour. One of the FPs mentioned:

> 'That's part [*of*] the capacity builder, you know, teaching the students. So, there are other, maybe, roles of family medicine [*that*] she's able to see or do them [*sic*] because then, in a way, she's forced to do because it's not just clinical'. (FP 1)

In RTC sessions, both registrars and FPs perceived that FPs helped registrars to integrate FM principles into academic presentations as explained by RG 3, '[*t*]hen she's able to guide me and tell me, this is how … you'll benefit using FM approach for anything you do in this programme'. In addition, some FPs agreed that supervisors helped registrars to focus on the practical aspects of the learning outcomes and apply them in their work environment:

> 'We don't want a situation where people are learning theoretically and not applying it on the ground. Because ultimately, it then skews the training programme to be kind of like a theoretical exercise. So, we mainly focus on the practical aspects of what they're actually learning and their learning objectives'. (FP 11)

Some registrars perceived that while FPs promoted an FM approach, FPs displayed good clinical teacher characteristics themselves. This includes their availability, reliability, openness, honesty in communication and ability to develop a good rapport, which enhanced the nature of their engagement:

> 'I think she's a very open and honest person, and it's easy to talk to her about issues that we are facing or things that is quite a stress for the entire group because we feel comfortable enough to talk about what's going on'. (RG 10)

Other registrars felt that their supervisors were organised, dedicated, very willing to teach and strict about adhering to punctuality. A few observed leadership and governance skills in their supervisors with the hope of learning from them.

Most FPs regarded themselves as effective communicators who established good relationships with the registrars:

> 'We have a one-on-one, we've built a relationship, there's a good communication relationship between both of us. He's able to understand me, and I'm understanding him better, which I think is important'. (FP 10)

Some FPs described their passion for teaching as their best characteristic, whereas others perceived their vast knowledge and experience as their strengths in supervision.

While good supervisor–registrar relationships enhanced engagement, a few registrars mentioned the impact of poor relationships. They felt that some supervisors needed to improve their communication skills in order to establish a better rapport with their trainees. In addition, some of the registrars expressed the need for a professional relationship with their supervisors:

> 'The challenges is [*sic*] in terms of the attitude or the atmosphere of the whole learning session, whereby if you pick up, for instance, that the supervisor is not really involved in what's

going on, it becomes like … it is a routine that needs to be sorted quickly'. (RG 6)

Professionalism affects engagement

Some FPs described how they work and support each other as a team while engaging with registrars. Some mentioned that they asked their colleagues to fill in for them when unable to attend planned academic sessions. One of the FPs (FP 6) said, 'I get support from other colleagues because I'm not always all the time [*sic*] there'.

Other examples of teamwork included FPs assisting the academic coordinators in planning the yearly programme. In addition, FPs in one of the districts provided registrars with feedback collectively, which helped novices learn from more experienced FPs. Registrars from the same district also observed that supervisors distributed tasks for better supervision:

'One of the things that so far we appreciate is that tasking; I think task distribution has made things much easier for us, and we think that it has strength because it was difficult to judge the previous family physician … him being alone because of these new ones, they have more hands, so it's easier for them to perform better'. (RG 4)

In contrast to working in teams, FPs in one of the districts perceived that training at RTC was often performed alone. They described a lack of support from their colleagues:

'Again, it's often only me that's there; if someone else pitches up, that's great, but we've got seven registrars, six in years one to three, so we have to do observed consults for all of them'. (FP 7)

Some FPs observed that the lack of professional behaviour and commitment by registrars affected their level of engagement. Family physicians believed that the registrars' preparation for topic presentations was sometimes inadequate or did not meet the required standards. As explained by FP 8, '… and initial presentations, they tried to do them shabbily, but we quickly said, "[*n*]o, you can't do that"'. Registrars sometimes displayed inappropriate behaviour by disregarding the FP's instructions and sometimes arriving late or not at all. A few FPs felt that some registrars who have completed the three training years were disruptive in RTC sessions. These were fourth-year registrars who were not actively involved in the programme for the year and were excluded from the study.

Another challenge identified by FPs and specialists among registrars was their inadequate baseline skills:

'I've had registrars who were put in paeds (paediatrics), and the consultant was not happy with the [*sic*] level of skills, or she negotiate[*d*] with me to put [*sic*] the registrar to do a call as [*sic*] a level of interns. Yes, so we have had challenges, specifically with registrar skills'. (FP 6)

Supervision is not ideal

Registrars and FPs identified that supervision was negatively influenced by inadequate time because of the multiple roles and responsibilities FPs must fulfil, thus causing registrars to be often left unsupervised. Other challenges that impacted the quality of supervision included the lack of standardisation in supervision and FPs' supervisory skills.

Time constraints among family physicians

Most FPs discussed how supervision is affected by their struggle to manage their multiple roles and responsibilities in clinical and non-clinical contexts. For example, some FPs kept postponing their supervising sessions at clinics or RTC because they were not available. For others, this conflicted with their administrative duties, such as unplanned meetings, clinical governance and service delivery or head of department roles:

'It was a big challenge. The reason is the time period. Sometimes you've got another commitment in the sub-district in terms of [*a*] meeting or something so that [*the*] programme is sometimes postponed'. (FP 2)

Many FPs could not conduct supervisory visits during registrar rotations because of severe FP shortages or inadequate support from their superiors. Most FPs felt that the district management did not support the need for protected training time. Some FPs found the RTC sessions tiring after the day's work. They had to prepare many topics, which they found overwhelming making it challenging to prepare them to the required standard:

'Most times, we are overworked and tired because at the end of it, like, we're just two, three of us, so at the end of the day you finish going through the whole day, from observed consultation of the patient, then by the time they come back in the afternoon, everybody is already tired'. (FP 3)

Registrars often feel unsupervised

According to most registrars, FP supervision in clinical and non-clinical contexts was less than adequate because of supervisor's non-availability at clinics and RTCs. Family physicians were occupied with multiple responsibilities, such as consulting patients, teaching students and administrative duties. Some registrars expressed the need for more opportunities to observe supervisor consultations at clinics and especially at hospitals, as they can only perform a limited set of skills at the clinics:

'I spent two months at PHC 10, three months at PHC 1. I got very little to no supervision in my primary health care. I want to say none. I hardly saw another doctor; it was a struggle for me just to see … I would love to have seen a doctor'. (RG 11)

Supervision is not standardised across the training sites

Supervision varied across the districts. For example, while four districts had academic sessions at RTC, FPs in one district felt that all training needs had to be covered in one clinic session, as they did not have academic sessions at RTC in their district. One of the FPs commented:

'It's not optimal as it is because we're spending just one day in a whole week together. We are not able to cover everything we have to do. Because now we have to cover the training in terms of the observed consultations, we have to practice one or two topics, in that same day'. (FP 10)

Some FPs explained how limited exposure to other FPs in the same district hindered registrars' access to varied expertise, skills and knowledge:

> 'The other challenge is maybe the registrars are limited in getting the experience from other family physicians. Probably you are the one who's going to train him, but previously when you compare, they will have different exposure, different skills, different approach, different knowledge, from a variety of family physicians'. (FP 2)

In some districts, FPs were not working alongside registrars. Yet, in other districts, the registrars worked with FPs in the same clinic for a short time, although there was no one-on-one allocation as an immediate supervisor. Family physicians felt that the objectivity of workplace-based assessments was reduced when the same supervisor was supervising the same registrar throughout their training years. Despite these site differences, the quality of supervision was good when one-on-one engagement took place, as described in the first two themes.

Another limitation identified by some of the FPs was their lack of skills across all domains and their preferences for teaching certain topics, which affected their one-on-one supervision:

> 'You may be weak on women's health, or you might be strong in paediatrics. Because it depends on where you came from, what you were doing before family medicine. So, I never have all the skills to help the registrar, but I'm just trying my best'. (FP 2)

The training environment is challenging

Family physicians and registrars mentioned various challenges in the training environment, including resource shortages, heavy workloads and personal obligations, which affected training and learning opportunities.

Insufficient resources hinder training

Most FPs and registrars perceived problems related to a lack of human resources in the form of insufficient FPs, equipment, or space for consultations:

> 'Some of the few challenges that we have in primary health care, that most of the skills that are listed we are not able to do them [*sic*] in the clinics. First of all, because of the laboratory issues. Secondly, most of the time, we don't even have those resources. For instance, your LP needles are not there. Sometimes, we don't even have injection needles. It's [*sic*] a lot of issues'. (FP 10)

Registrars and FPs from remote sites felt that the shortage of FPs was more evident in these areas:

> 'There are only two family physicians, so this district is quite big from … it's 300 kms from the one side to the other side; it is difficult for two of them to get to all the registrars'. (RG 8)

Some registrars said that the lack of complex patients was why they could only practise a limited set of skills at the clinics, which meant that they were inadequately prepared for the national exit examinations:

> 'The challenge for me is the complexity of the patients that we have here. So sometimes you feel that the reg [*registrar*] might seem to be doing well but because the patients are not … let me not say, are not difficult, like they are easy cases in a way, they are not that complex in terms of for … and I cannot say the … I cannot guarantee in terms of that, in the exam this is what the reg is going to get'. (FP 1)

Work–life balance is challenging for registrars

Most registrars perceived that the patient load was too heavy, which hindered training in their clinical contexts. As a result, they focused on seeing patients and clearing the queues instead of actual learning utilising the FM approach. These challenges reduced the opportunities for registrars to be supervised on their consultations and procedures:

> 'You are faced with a challenge of service delivery versus (the) learning you need to learn [*sic*] as a registrar. So, obviously, that balance needs to be found where you can't compromise service delivery for learning. And also, learning can't be compromised at the expense of service delivery. So, it's quite difficult to be in a busy clinic'. (RG 1)

Another challenge was managing personal and family obligations along with academic requirements. One of the registrars said:

> 'You have a family as well when you come back home. You have children you have to take care of … and you also have your family medicine activities that you need to do, like your assignments, and you're, should I say … things that have to be up to date, for your own training, but then you have other activities that require some time from you'. (RG 9)

The district hospitals are perceived as hostile

The perceived hostility towards FM training at some district hospitals posed a particular set of challenges. Some FPs felt that the managers in these hospitals were not welcoming or supportive of the training programme. The full-time MO felt threatened when FPs rotated at the hospitals to supervise the training of registrars. One of the FPs said:

> 'Some of our colleagues are not favourably disposed to moving into the hospital … because of the hostility; it's a two-pronged thing. Because of the hostility we're also getting from DH4 [*district hospital*] because they always feel threatened when they see [*us*]'. (FP 3)

Discussion

This study is the first attempt to explore the strengths and challenges of decentralised postgraduate FM supervision in an African context. Overall, participants perceived an acceptable level of postgraduate FM supervision at DCT sites, with good supervisor characteristics. Supervisors provided multiple training opportunities to registrars despite their numerous roles and responsibilities. Despite the several challenges that could impact the quality of supervision, many strengths of supervision were identified, which support the need for continuing DCT.

One of the significant strengths of supervision in this study was the individual engagement in the clinical context. Both FPs and registrars valued the informal training opportunities

when they, for example, saw patients together, consulted on difficult and complex patients, and conducted in-depth discussions on diagnoses and management. The individual engagements facilitated good role-model behaviour and several types of interactions integral to supervision in WBL, including support seeking, monitoring, modelling, making meaning and feedback.[41] The FP supervisors appreciated utilising mini-clinical evaluation exercises as formative rather than summative assessments during individual engagements, overcoming the tension between them, as described by Prentice et al (2020).[40] The FP supervisors also valued the opportunities for creating learning experiences and providing feedback during one-on-one engagements with registrars. However, some registrars felt that these individual interactions were subjective and depended on the supervisors' experience. They were dissatisfied with being supervised by junior supervisors or MO similar to the findings from studies evaluating FM programmes in other settings.[38,53] In some districts, workplace-based assessments needed to be carried out by multiple assessors with different levels of experience in various contexts in order to assess registrar performance and make it more authentic.[37] Registrars felt that mini-clinical evaluation exercises were sometimes rushed, resulting in minimal contact time with supervisors, as has been described previously.[54] In other situations, the lack of pairing registrars with immediate supervisors hindered the possibility of assessing the registrar's longitudinal progress in workplace-based assessments. The pairing of registrars with FPs, as seen in some districts, can cause leniency in workplace-based assessments because of the assessor–trainee relationship, as explained in a previous study.[40]

While fewer individual engagements were possible in non-clinical contexts, a positive aspect of supervision in these sites was receiving opinions and perspectives from multiple FPs, which the registrars felt improved their knowledge of specific topics. The senior registrars, particularly, benefitted from receiving different opinions, which provided a holistic picture of their progress.[40]

Another major strength was good clinical supervision by non-FP supervisors when registrars rotated in speciality disciplines, although it varied across departments. The non-FP supervisors engaged FM registrars to practise procedures repeatedly under their guidance, allowing them to master their skills. Despite its strengths, the non-FP supervision presented some challenges. While the focus of non-FP supervisors on clinical supervision was perceived as a positive aspect, the registrars felt that the non-FPs became absorbed in the clinical speciality, leaving insufficient time to practise the biopsychosocial aspects of patient consultation, which was aggravated by little or no FP supervision, as found previously.[55] Although most non-FP supervisors were specialists, registrars from specialities other than FM and senior MO sometimes supervised FM registrars in some clinical departments. The lack of supervision training of these registrars and MO impacted their on-the-job training of the FM registrars. Previous studies in SA have shown that a lack of adequate training in supervision negatively influences the capability of supervision.[42,56] Another aspect arising from the lack of training of the non-FP supervisors, mentioned by FPs and registrars, was the lack of understanding of FM outcomes and the scope of practice of registrars, which influenced the ability of registrars to incorporate FM principles or approaches in treating their patients. The lack of supervision and training challenges of registrars on FM concepts and topics by non-FP supervisors during their hospital rotations was also found in other settings.[38,57] Some registrars described the need for constant engagement with non-FP supervisors and supervisory support visits by head of departments or academic training coordinators from the FM department to regional hospitals in order to address these challenges.

Registrars and FPs valued responsiveness to registrar learning needs by FPs as a strength. Family physician supervisors supported individual learners at the workplace, focussing on developing them and addressing their learning needs and potential, which is critical in DCT.[3,10] According to registrars, they learnt different FM principles and their applications and sound FP approaches from their FP supervisors in all contexts. Family physicians felt that they were training registrars in all the required FP roles, such as clinical trainer, community leader and governance roles, other than their consultant role, although registrars did not perceive that. As registrars did not recognise these FP roles, this suggests the need for creating more registrar opportunities to practise all the expected FP roles[35,42] in order to ensure that all learning outcomes[37] are achieved.

According to registrars and FPs, FP supervisors had good clinical trainer and supervisor attributes or acted as good role models with excellent communication and organisational skills, openness, honesty, willingness to teach and teamwork, as found in previous studies.[12,24,25,58] In some districts, FP supervisors worked as a team when challenged because of their multiple roles or level of experience in training by sharing their responsibilities. Teamwork is essential for professional satisfaction, as described in the UK medical education system.[39] Developmental conversations[20] between supervisors and registrars become ideal when the learning environment and supervisor–registrar relationship is optimised,[26] which were constrained in some training sites. Supervisors need to strive to be good role models in the workplace as part of learning organisations to develop and maintain good communities of practice[13] that influence registrar learning experiences and professional identity formation.

Some FPs perceived a lack of professional behaviour of registrars as an obstruction to meaningful engagement. However, teaching and assessing professionalism should not be left to chance. Professional attributes should be intentionally taught and regularly assessed among registrars.[21,59] When the registrar's performance is affected,

the FP's responsibility is to explore the factors affecting it, including the registrar's professional behaviour. Multiple opportunities exist to explore these factors on a DCT platform, where FPs and registrars work together. An approach to the registrar's inadequate performance is to explore registrars' skills and knowledge level and internal factors (such as personality traits or attitudes determining their professionalism) and external factors (such as workload, resource availability and family responsibilities).[22] The selection of appropriate candidates with adequate baseline skills and knowledge was also a critical factor identified by Ras et al (2020).[45] This is because, in WBL, supervision depends substantially on self-regulated learning,[28] registrars' reflection capabilities and how they utilise the informal learning opportunities in workplace.

Most participants agreed that the severe shortages in human resources, equipment and infrastructure, and inadequate exposure to complex patients and skills impacted on registrar's learning in primary-care clinical contexts. Most registrars felt that the supervision was not always ideal in clinical and non-clinical contexts because of inadequate supervision or FPs' heavy workloads. Many registrars expressed the desire for supervision to be more visible and to have supervisors in their environment more often. The non-availability or inadequate number of FPs resulted in registrars competing for interactions or contact time, which affected their training opportunities. The emphasis was on the need for more modelling opportunities with their supervisors, as identified in several previous studies.[44,45,40]

Most FPs struggled to fulfil their multiple roles, including administrative tasks, service delivery and training commitments in both clinical and non-clinical contexts. Effective supervisors are expected to fulfil various roles and responsibilities, such as medical experts, managers, communicators, healthcare advocates and scholars in clinical settings.[60] Family physicians felt the need for protected time for registrars and supervisors to fulfil training requirements while busy with their various roles and responsibilities and management support, as found in a United Kingdom study evaluating WBL.[61] The concepts of supervision in WBL emphasis informal learning and reflection, need to be explained to registrars but supervisors should provide these opportunities, allow registrars to work in other communities of practice,[13] maximise cognitive apprenticeship strategies,[11] create a culture of belonging and set aside time for engagement.[10] This can avoid the disappointment of the registrar expectations of having more formal sessions in postgraduate training. The FP supervisors should also be clinically relevant and competent,[19,44] which was not the case here, as FPs identified a lack of teaching skills in some clinical domains.

Another constraint affecting the quality of supervision was the training environment itself. An enabling training environment in DCT depends not only on the FP training abilities but also on the workplace infrastructure, organisational structure, equipment, optimum supervisor-to-trainee ratio and appropriate patient mix,[3,58] which was a limitation at most sites. Contextual health system factors, such as workload, work patterns and distribution, were major system factors that influenced learning interactions between supervisors and registrars, as identified in previous studies.[7,10,45,41] In smaller clinics, the training environment was even worse.[7,27] In addition, few registrars recognised the need for developing coping mechanisms to balance their academic requirements with family and work commitments, which impacted negatively their training opportunities.

Even though the need for standardisation of DCT programmes across universities was identified in previous studies in SA,[58] it remains a challenge as observed by both groups of participants in this study. The perceived hostility from some district hospitals not identifying themselves as training institutions also needs to be addressed in order to standardise training opportunities for registrars across these hospitals.

Limitations

The principal author interviewed the participants, being the supervisor for three of the 11 registrars and a colleague of the FPs. This could have affected the participants' responses and introduced bias. However, the benefits of being a researcher with insider knowledge outweighed the risks.[62] Electronic interviews with some participants may have missed some non-verbal cues and responses, as there was no face-to-face contact.

Recommendations

The university needs to play an advocacy role in improving the supervision and support given to registrars, achieving standardisation, and addressing the human and other resource shortages across the decentralised training sites. There should be a provision of protected time both for registrars and especially for supervisors, who are busy with multiple roles and responsibilities approved by the district management. Regular conversations between the various sites on improving supervision, training and support for registrars in clinical contexts such as clinics, hospitals and RTCs are essential. Multiple supervisors should carry out workplace-based assessments in different contexts to measure registrar performance authentically in order to improve their learning experience. Regular updating of FPs' skills and faculty training in supervision of both FPs and other non-FP supervisors involved in training are required to promote alignment with registrars' learning needs. Registrars should be adequately educated and prepared on aspects of WBL in decentralised contexts.

Conclusion

This study exploring postgraduate FM supervision in a decentralised training context identified multiple strengths and challenges. While there is a good level of supervision, it is context-specific and supervisor-dependent found in other

studies. Supervisors displayed good clinical-teacher characteristics, but their supervisory roles can be further improved in various contexts. Good supervision of registrars requires excellent clinical knowledge, professionalism and allows internalising appropriate FP approaches and skills. However, there are supervisory challenges because of multiple FP roles, a lack of standardisation and insufficient understanding of the registrar's scope of practice by non-FP supervisors. The training environment has various other challenges, such as heavy workload and human resource shortages. The study findings provide a baseline knowledge of aspects of postgraduate supervision and its strengths and challenges in similar contexts. Future research involving other decentralised training sites in sub-Saharan Africa will provide a more comprehensive picture of postgraduate FM supervision. This enhances the training of FPs based on primary care contexts, addressing the community's needs and translating into better health outcomes.

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Authors' contributions

N.J.E. conceptualised the research, collected and analysed the data, and wrote the first draft of the manuscript. A.Z.G. and L.S.J. contributed to the data collection, analysis and revised the subsequent drafts of the article. All authors contributed to the development of the manuscript and approved the final version.

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Data availability

Data are available upon reasonable request from the corresponding author.

Disclaimer

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Appendix start on next page →

Appendix 1: Interview guide

Questionnaire A (Registrar)

1. How are you supervised by Family Physicians at
   a. Regional training centre
   b. Primary health care clinics and
   c. During skills rotations in the district and regional hospitals?
2. What are the strengths and challenges in supervision at
   a. Regional training centre,
   b. Primary care clinics and
   c. At skills rotations in the district and regional hospitals?
3. How are you supervised by other specialists at the district and regional hospitals during your skills rotations?
4. What are the strengths and challenges of supervision during skills rotations in the district and regional hospitals?

Questionnaire B (Family Physician)

1. How do you supervise registrars at
   a. Regional training centre
   b. Primary care clinics and
   c. During skills rotations in the district and regional hospitals?
2. What are the strengths and challenges in your supervision at
   a. Regional training centre
   b. Primary care clinics and
   c. In the district and regional hospitals?
3. How are the registrars supervised by other specialists at the district and regional hospital during their skills rotations?
4. What are the strengths and challenges of supervision during skills rotations at district and regional hospitals?

CHAPTER 6. WORKPLACE-BASED LEARNING OPPORTUNITIES: PERCEPTIONS FROM A SOUTH AFRICAN FAMILY MEDICINE POSTGRADUATE TRAINING PROGRAMME

> "*Modelling lifelong learning is about willingness to admit ignorance and preparedness to learn from trainees." (Ramani and Leinster 2008)*

6.1. INTRODUCTION

This original research article was published in the **African Journal of Primary Health Care and Family Medicine:**

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This article presents the participant's perceptions of the workplace learning opportunities in the postgraduate family medicine decentralised training programme, which was a 'process' in the logic model evaluated in this study.

I presented this research at two international conferences, the World WONCA conference hosted in Sydney, Australia, in October 2023 and the AMEE conference in Glasgow, UK, in August 2023.

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Workplace-based learning opportunities in a South African family medicine training programme

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Background: Workplace-based learning (WBL) provides authentic learning opportunities to develop fit-for-practice healthcare workers. Different types of WBL opportunities have been described in high-income countries, but the opportunities in the district health systems of sub-Saharan Africa have not been characterised.

Aim: This study explored family physicians' (FPs) and registrars' perceptions of WBL opportunities in a decentralised postgraduate family medicine registrar training programme.

Setting: The study was conducted at five decentralised training sites across two provinces affiliated with the University of the Witwatersrand in South Africa.

Methods: This instrumental case study involved semi-structured qualitative interviews with 11 FPs and 11 registrars purposively sampled across the training sites. The verbatim transcripts were thematically analysed using Braun and Clark's six-step approach.

Results: Workplace-based learning opportunities were grouped into four themes: Learning from interpersonal interactions, learning from district activities, self-directed learning and contextual influences on learning opportunities. Registrars learnt from patients, peers, FPs and other professionals. Feedback, self-reflection, portfolio use, involvement in various district events, such as student and staff teaching, and continuous medical education augmented learning. Contextual influences originated from health facilities, resource availability, district management and university support, excessive workload and a need for standardised district learning opportunities.

Conclusion: Registrars are exposed to several types of WBL opportunities in district health systems. Effective engagement with available opportunities and addressing contextual challenges could enhance registrar learning.

Contribution: Maximising learning opportunities to promote registrars' acquisition of required skills and competencies to efficiently address community needs in a middle-income country such as South Africa.

Keywords: decentralised clinical training; family medicine; family physician; postgraduate training; postgraduate registrars; workplace-based learning; workplace learning opportunities.

Introduction

The World Health Organization's (WHO) Astana declaration (2018) advocated strengthening primary health care (PHC) services and prioritising universal health coverage, focusing on preventive, promotive, curative and rehabilitative care services.[1] The training of skilled health workers to address community needs is a global priority.[1,2] Medical training institutions continually modify curricula to equip postgraduate trainees with the knowledge, skills and professional attitudes needed to address community needs.[2,3,4,5,6,7] Workplace-based learning (WBL) involves trainees learning in the workplace by meeting the clinical service delivery requirements and utilising authentic contexts for optimal training and skills development.[8] Studies on WBL have been conducted in high-income countries such as the Netherlands and the United Kingdom, but very few studies have been conducted in sub-Saharan Africa, including South Africa (SA), on workplace learning experiences. An in-depth exploration of views of WBL opportunities in postgraduate training based in an SA district health context is still lacking. This article describes the various types

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Note: Due to small participant sample and in order to maintain participants confidentiality limited participant identifiers are provided.

of WBL opportunities and workplace factors influencing WBL in the district health context of SA.

Learning in the workplace

Workplace-based learning ranges from learner-centred, informal, unstructured learning in the absence of a trainer to formal learning in the presence of a mentor or supervisor.[8] Informal WBL lacks the defined curriculum, timetables and linear teaching that characterise formal teaching at the university level, resulting in criticisms about WBL being disorganised and opportunistic.[8] Despite a perceived lack of educational rigour, process and structure, WBL is becoming the preferred strategy.

Workplace-based learning draws on several learning theories, including cognitive, socio-cognitive and social constructivist theories.[8] The cognitive theories emphasise individuals learning from their own experiences and self-reflective processes, while the socio-cognitive and social-constructivist theories focus on learning from social interactions.[8] In cognitive theories, learning is seen to happen during the interplay between existing and new knowledge.[9] In socio-constructive theories, learning is visualised as part of everyday practice and occurs by engaging with peers, supervisors and other healthcare team members. Informal learning at the workplace involves implicit, reactive and deliberative learning.[10] Implicit learning refers to knowledge acquisition that happens with no conscious attempt to learn; reactive learning is about spontaneous intentional learning that occurs while performing an action, and deliberative learning involves planning towards defined learning goals.[10]

Self-regulated and self-directed learning are integral components of WBL. In self-regulated learning, trainers regulate learning primarily in academic environments. In contrast, self-directed learning involves trainees developing their learning goals, identifying activities and resources and seeking external feedback at their workplaces.[11] While self-directed learning is moderated by internal processes such as self-reflection, it is also modified by external educational interventions, such as feedback, assessments and learning portfolios.[12] Self-directed learning consists of short loops that are triggered during consultations with a lack of knowledge during minor learning activities at the work place.[12] Long loops include more extended learning periods based on complex problems, such as difficulties in communication or handling cases such as child abuse.[12]

Factors affecting workplace-based learning

Several personal, interpersonal and contextual factors affect WBL. Personal factors that enhance learning include learner behaviours such as active involvement, accountability, professionalism, conscientiousness and acceptance of criticism.[13] Prior experience, knowledge, motivation, attitude and confidence also affect trainees' learning.[14,15,16] A lack of concentration, difficulties in dealing with negative feedback and managing work and private life, and being passive learners with a lack of motivation act as barriers.[12,13,17] Trainees' WBL is enhanced when using workplace artefacts such as case reports, reflective logs or portfolios.[16]

Interpersonal factors affecting WBL arise from trainees' interactions with peers, supervisors, other professionals and patients.[16,18,19,20] More WBL takes place during interactions with peers and supervisors[18] and as part of informal discussion or handovers than when trainees work alone.[19] Peer interactions motivated trainees to put in extra effort to reach their peers' standards.[19] Interaction with a supervisor affirms trainees' behaviours, actions and decision-making during patient consultations and helps them apply their knowledge.[21] Other motivational factors are supervisor, mentor or peer engagement and feedback offered in a safe environment,[15] good supervisor-trainee relationships, supervisory commitment, opportunities for supervision, and mutual observation and dialogue.[13] In contrast, poor supervision and supervisory relationships hinder learning.[12]

Inter-professional or intra-professional interactions promote informal and formal learning[16,18,22] through reflective practice, spontaneous or triggered, implicit through participation, increasing self-awareness and developing coping mechanisms.[16] Learning is enhanced by social integration, various task allocations, and successes and mistakes.[23] Trainees also learn from engagements with patients[20] and their families, through reflecting on patient encounters, especially with difficult or peculiar patients,[22] critical incidents and patient communication.[24] During patient interactions, trainees identify deficits in medical competencies but not always their lack of general competencies, such as communication skills and ethics.[19]

Workplace-based learning needs a supportive clinical environment, as it directly influences patient-care practices.[25] A conducive WBL environment requires material resources, an appropriate patient mix and clinician-to-patient ratio, sufficient clinical trainers, a manageable workload, protected time for learning and support from relevant stakeholders.[26,27] Creating a positive learning environment with sufficient trainee support and knowledgeable, passionate and skilled trainers is vital.[26,27,28] A collaborative learning climate encourages reflection, feedback, debriefing, supervision and guidance from supervisors.[14] Organisational factors, such as the layout of the work environment, interpersonal dynamics among team members and the availability of complex patients[14] augment learning.[16] Health system factors such as high supervisor and trainee workloads and high patient volumes prevent trainee observations.[13]

Workplace-based learning in South Africa

Two SA studies identified several factors that promoted and hindered WBL experiences. One study of postgraduate registrars (SA trainees) in a laboratory setting categorised the origin of these factors as the university, workplace,

home circumstances and personal.[29] Academic role models and supportive trainers who enjoyed teaching promoted learning, while unstructured academic activities, feelings of demotivation, conflicting family and work responsibilities and negative supervisor feedback hindered learning.[29] A family medicine (FM) study identified context, adequate utilisation of a learning portfolio, patient consultations, engagement with clinically relevant supervisors and providing sufficient feedback as promoting learning.[30]

Registrar learning in workplaces in post-graduate FM decentralised training at the University of the Witwatersrand (Wits University) in SA is primarily based on self-directed and self-regulated learning. The university curriculum and national learning outcomes, as determined by the SA Academy of Family Physicians (FPs), are readily accessible in the public domain.[6,31] Registrars develop individualised learning plans aligned with the national learning outcomes, according to their learning goals in workplace settings. The activities they undertake to achieve their goals, including setting timelines and finding resources, are augmented by guidance from their supervisors.[31] Workplace-based learning involves clinical and educational supervision by FPs or specialists in various disciplines during clinical rotations, the annual compilation of a learning portfolio and formative and summative assessments.

The study reported in this article forms part of a broader mixed methods case study, evaluating a postgraduate FM decentralised training programme by using a complex programme evaluation logic model. The previously published articles from the larger study reported on resource availability, postgraduate supervision and supervisory feedback evaluated as the inputs, processes and outputs of the logic model.[32,33,34] This article reports on the FPs' and registrars' perceptions of types of the learning opportunities, registrars' learning behaviours and the learning environments of the decentralised postgraduate FM training.

Research methods and design

Study design

Case studies explore, in-depth, the multiple perspectives of the complexity and uniqueness of a phenomenon in a 'real life context' of a 'bounded system', such as a programme or an event[35] by using various data sources and data-collection methods.[36] An instrumental case study focuses on a particular case to gain in-depth insight into an issue or to redraw a generalisation.[35] An instrumental case study investigating the various aspects of the 'phenomenon of interest', that is, the postgraduate FM decentralised registrar training programme, in the context of Wits University was conducted.

Study setting

This qualitative study was conducted at five decentralised training districts affiliated with Wits University. There were four study sites (Ekurhuleni, Johannesburg Metro, Sedibeng and West Rand) in Gauteng province and a fifth site in the Dr Kenneth Kaunda district in the North West province.

Wits University registrar training involves 3 years of district-based training, including annual 3-weekly training blocks at the university and a fourth year of elective rotations. District training takes place across various facilities, including community health centres, which are 24-h facilities providing primary healthcare services, run primarily by nurses[37] with support from general practitioners and FPs. The smaller district hospitals provide comprehensive health services and are staffed mainly by general practitioners, with a few specialists, including FPs.[38] Regional hospitals support district hospitals and are led by resident specialists.[37] Regional training centres are based in community health centres or district hospitals and are the sites for weekly academic engagements between FPs and the registrars. Registrars rotate for 2–3 months in various clinical departments of the district or regional hospitals, depending on the training district. Registrars typically engage in academic discussions or presentations on various clinical or non-clinical topics, facilitated by FPs in groups or one-on-one sessions. Family physicians facilitate registrars' case presentations at community health centres or district hospitals and supervise the registrars according to the learning portfolio requirements. Specialists and senior doctors in various disciplines supervise the registrar learning during clinical rotations.

Study population and sampling

The target population comprised 20 FPs and 21 registrars. These individuals were purposively sampled[39] because they were perfectly positioned to provide in-depth insights into the WBL opportunities in the programme. Purposive sampling involves the deliberate selection of individuals or sites[39] to achieve representativeness across settings, capture adequate homogeneity of the study population by obtaining a range of variations and examining critical cases to compare or illuminate the differences between settings or individuals.[40] The FPs and registrars had varying exposures to and experiences of WBL opportunities in the decentralised training programme depending on their roles and responsibilities in each district. We included FPs and registrars from all five training sites for broader geographical representation.

All second-and third-year registrars in the programme were invited to participate. First-year registrars were omitted as they did not have adequate training experience to contribute meaningfully. Registrars in their fourth year and beyond were excluded as they were completing their elective rotations and were not actively involved in the yearly training programme. Family physicians, who are jointly appointed by the university and the relevant provincial health departments, were invited to participate. Recently qualified FPs who had not registered as specialists and were not joint appointees were excluded. All participants who were invited from the FPs and registrars agreed to participate in the study. The final samples consisted of 11 FPs and 11 registrars.

Data collection

The principal author conducted 80-to-90-min semi-structured interviews between March and August 2020. Eight face-to-face interviews were conducted with the remainder (n = 14) on Zoom or Microsoft Teams because of the coronavirus disease 2019 (COVID-19) lockdown. Table 1 represents the interview guide. The interview process continued until data saturation was reached.[41] The interviews were audio-recorded, transcribed verbatim and checked for fidelity. The registrars and FPs transcripts were open-coded[42] (first level of coding into individual segments) separately. Codes were compared and contrasted across the transcripts for each participant group. No new codes were identified after nine interviews from each group, but two more were interviewed from each group to ensure data saturation.

Data analysis

Braun and Clark's six-step approach to thematic analysis was used to analyse the transcripts.[41] The steps are: (1) familiarisation with the data; (2) generation of initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes; and (6) producing a final report.[41] MAXQDA 2020 (Verbi Software, Berlin, Germany) was used to manage the analysis.

The initial coding system was checked by the two co-authors until agreement was reached on the naming of codes. The final coding system was applied to transcripts through an iterative process of coding and checking until agreement was reached about grouping codes into categories and themes, and reviewing and naming the themes.

Trustworthiness

Frequent discussions between the authors improved the intercoder reliability and the credibility of the findings.[43] A codebook was developed and constantly revised until the coding system was finalised, further improving credibility.[44] Detailed descriptions of the study methods, including setting, inclusion and exclusion criteria, and data collection, augmented the transferability.[45] Data triangulation from the two groups of participants also improved credibility and dependability. Dependability of the findings were further improved by recording decisions made from the emergent data at a particular time and their rationale, and how various codes and categories were grouped, themes developed, reviewed[46] and renamed during analysis.

Reflexivity relates to the degree of bias that the researcher intentionally or unintentionally introduces into the research.[47] The primary author was cognisant that her position as a supervisor and colleague to some participants may have influenced their responses. She mitigated these by reassuring them about the anonymity and confidentiality of the findings. She also self-critiqued and constantly reflected on her personal biases and assumptions in a journal to improve the confirmability. The co-authors were not involved in the postgraduate FM training being evaluated. Their reflexivity centred around their roles as medical educators – they reflected, examined and explored their interpretations of the findings based on their involvement and experience in postgraduate FM training.

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of the Witwatersrand Human Research Ethics Committee (Medical) (No. M191140). Permission to conduct the study was obtained from five districts through the National Health Research Database (GP_201910_050). Informed written consent was voluntarily obtained from study participants.

Results

The age of the registrar participants' (RG1–RG11) ranged from less than 30 to 60 years. Six registrars were in their third year and five were in their second year of study. Registrars had PHC experience before joining as community service doctors, medical officers or in private practice. The FP participants' (FP1–FP11) ages ranged

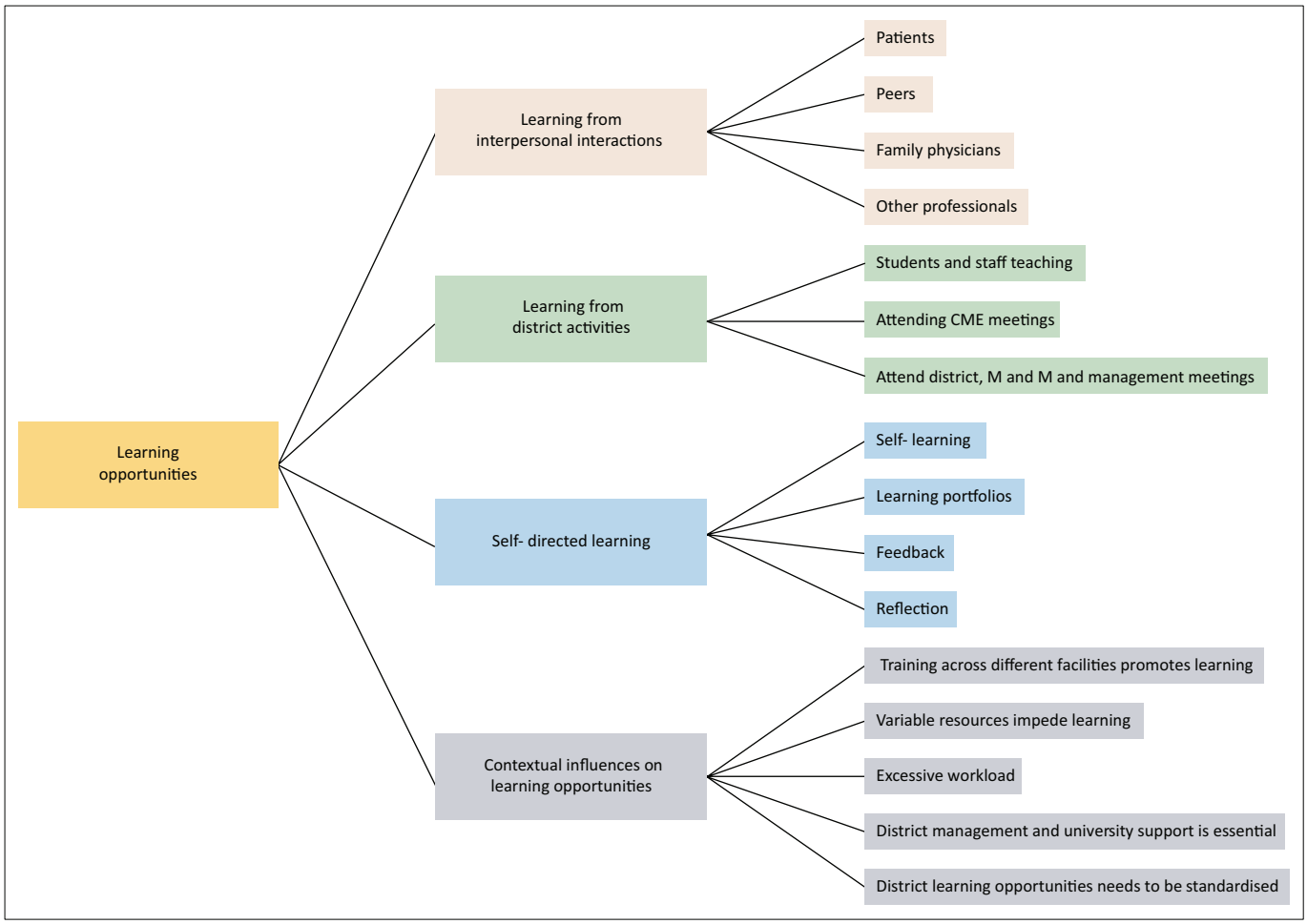
TABLE 1: Interview guide.

Registrar questionnaire	Family physician questionnaire
How would you describe your learning environment in your district?	How would you describe the learning environment for registrars in your district?
What are the learning opportunities for you in the district?	What are the learning opportunities for the registrars in your district?
What do you think about your learning behaviours in your district?	What do you think about the learning behaviours of your registrars in your district?
What do you think about the opportunities for interprofessional learning in your district?	What do you think about the opportunities for interprofessional learning in your district?
What do you think about your use of portfolio as a learning tool?	What do you think about the use of portfolio as a learning tool by your registrars?
What do you think about the feedback given to you by the family physician?	What do you think about the feedback given to your registrar by you?
How do you reflect on the feedback given to you by the family physician?	What do you think about the registrar reflection on the feedback given to them by you?
What do you think are the challenges for your learning in the district?	What do you think are the challenges for registrar learning at your district?

FP, family physicians.

TABLE 2: Participants' characteristics.

Characteristics	Registrars'	Family physicians'
Age		
≤ 30	3	-
31–40	6	-
41–50	1	8
51–60	1	3
Sex		
Male	5	7
Female	6	4
Nationality		
South Africa	7	5
Not South Africa	4	6
Year of training		
Year 3	6	-
Year 2	5	-
Years of training experience		
1–5 years	3	-
> 5 years	8	-



CME, continuing medical education; M and M, mortality and morbidity.

FIGURE 1: Themes and subthemes.

from 41 to 60 years and most had more than 5 years of training experience (see Table 2).

The four themes identified were classified according to the learning opportunities from people, activities, self and the environment. Figure 1 shows the sub-themes within each theme.

Learning from interpersonal interactions

Registrars perceived that the learning opportunities were primarily from patient interactions, other professionals and FPs. The FPs agreed with registrars but thought there were peer learning opportunities for registrars during training.

Patients

Registrars and FPs felt that the registrars had adequate opportunities to learn from undifferentiated and complex patients with various conditions. These challenges broadened their thinking processes:

> 'You get the opportunity to be exposed to so many available, let me say, good patients that will come with many challenges at once. So, a complex patient. You'll have this very often that challenges you as a clinician to broaden your thinking and to do.' (RG 6)

Most registrars recognised the importance of taking each patient encounter as a learning opportunity. Each patient motivated them to apply FM principles, read the literature and critique their approach to patient management:

> 'I'm having to at least take one patient a day, go back home, read the way that my supervisor has shown me, look at what case I had, and look at whatever … identify at least one problem where the patient … look at the literature … and also critique my approach to the patient.' (RG 10)

Peers

Family physicians thought registrars learn by interacting with senior registrars:

> 'People like RG 3 [*registrar*] were senior at a point in time. When they were junior[*s*], there were people who were senior[*s*] ahead of them. Now RG 4 and them are consultants; they are still around. RG 3 are consultants, [*and*] they are still around. So now we have RG 6 and RG 1. So, there are opportunities for intergenerational learning.' (FP 9)

Family physicians

Registrars mentioned discussing patients with FPs at their workplaces as an excellent learning opportunity. During patient consultations, the presence of FPs provided opportunities for registrars to identify their strengths and challenges, which motivated them to read more about the patient:

> 'I have access to my supervisor, even outside our formal working time. So, I'm free to discuss cases that I encounter with him, so this gives me an opportunity to learn. I can go back and search in terms of resources on the case that I encountered … I did discuss it with him, and then with my supervisor, who will also give his input, so, from this is [*sic*] a very good learning opportunity.' (RG5)

Family physicians agreed with registrars that they had more opportunities to practice FM principles in the presence of their supervisors:

> 'Where the registrar is placed, and he or she can make use of all those tools adequately and necessary, with supervision or with help, is important.' (FP 10)

In contrast, many registrars felt they did not have adequate opportunities to observe role modelling, either because of the lack of availability of FPs but more often because of the small number of FPs or their multiple roles. Registrars wanted to observe more of their consultant's approach to patients and their families, which was sometimes challenging:

> 'Just … sufficient family physicians … I think it would add a lot of value if we had … if we worked with family physicians, it would help us to learn how to be a family physician. So how to approach things, what is their viewpoint and how to more readily interact with the community and family aspect of the patients [*sic*].' (RG 7)

Other professionals

Both registrars and FPs described how they learned from other professionals, including nurses, physiotherapists and others who worked with registrars at clinics and hospitals. Participants had mixed opinions on learning from other professions at the clinic level and most registrars agreed that more opportunities arose in the hospitals rather than at clinics:

> 'Definitely at the bigger hospitals, I think it's good, and I have attended like some of their training, especially with the physiotherapists, in say, in orthopaedics, and OT [*occupational therapy*], with the making of different splints and exercises.' (RG 8)

> 'The opportunities are abundant, I think, in that the nursing staff or other sections of the clinics within the district are always open and willing to [*answer*] any questions that you have or if you want to know how their systems work, or … get them to teach you a skill, then those opportunities are always available.' (RG 7)

Family physicians raised concerns that despite various opportunities to learn from other professions, registrars did not maximally utilise them, even at the clinic level:

> 'I tell this registrar, you've got an optometrist who's got a big machine that we've just bought for her, why are you struggling to know how to do fundoscopy … You can make a time and go to her and say, I'm going to come to you every Friday for one hour for the next two months. So, the opportunities are there, but I'm not so sure whether our registrars are using it on their own.' (FP 9)

Some registrars agreed with FPs that they could have made better use of interprofessional learning opportunities:

> 'I think our learning is quite fragmented. You mostly learn from the doctors, from the family physicians. We do sometimes get involved in student teaching. But in terms of your multidisciplinary level of teaching involving nurses, physiotherapists, OT [*occupational therapists*] … it's from person-to-person interest, but there's not much integrated learning.' (RG 1)

Learning from district activities

According to FPs and registrars, registrars' active involvement in training medical and other students and staff is an essential component of WBL learning. Most registrars and FPs concurred that registrars had opportunities to participate in district CME (Continuing Medical Education) activities, community-oriented primary care with home visits and mortality and morbidity meetings, which enhanced their learning.

Students and staff training

Registrars and FPs felt that registrars training junior doctors, supervising interns or students, and conducting student assessments provided registrars good learning opportunities:

> 'By giving an opportunity to [*the*] registrar to train other, for example, giving in-service training, training junior doctors, training interns, by giving them [*the*] responsibility to supervise, also that's going to help them.' (FP 2)

Some registrars perceived that utilising those opportunities augmented their ability to gauge individual knowledge levels and structure training sessions according to the level of various student groups:

> 'There is something to learn in terms of teaching styles, how to conduct a teaching or training session, how to gauge the level of knowledge in terms of how you should focus your training for the different levels of students. Firstly, you won't treat the final year the same as a third-year or a clinical associate, first-year as a fifth-year medical student. So, you need to be able to gauge the content need(s) of the students.' (RG 1)

Attending CME meetings

According to registrars and FPs, another learning opportunity was participating in CME meetings and workshops where different professionals presented and interacted with registrars:

> 'Like there's a couple [*of training courses*] that I actually attended last year that I thought there is something happening. I have attended something to do with malnutrition, I have attended mental health [*training*], I have attended HIV [*human immunodeficiency virus course*], so I think, yes, when there is something going on, they do inform us, and they do allow us to go.' (RG 9)

Attend district, mortality and morbidity and management activities

Family physicians mentioned that participating in district community-oriented primary care and quality improvement projects facilitated registrar learning at the workplace:

> 'And also apart from the clinical care, then his [*the registrar's*] research, QIPs [*quality improvement project*], the COPCs

[*community-oriented primary care*] with the WBOT [*ward-based outreach team*]. I want him [*registrar*] to be involved.' (FP 10)

Another critical opportunity was the registrars' participation in the mortality and morbidity meetings, where the group discussed missed opportunities in patient management and registrars learned how to improve patient care in similar situations:

'There's M and Ms [*mortality and morbidity*] meetings that I've gotten to attend at PHC 3, I think that's been a learning opportunity where you sit, you see what mistakes have been made, and even before you make that mistake, you're now in a better position [*because*] you've learnt from the case. So, I think M and Ms are also a good opportunity … to also, as a professional, give feedback on what could have been done.' (RG 2)

A significant concern raised by a few FPs was that registrars were insufficiently exposed to leadership roles to prepare them to take on these roles once qualified as specialists:

'Especially maybe our senior registrars, looking back in terms of even when we were registrars, say, for example, we never attended any senior meeting. Now suddenly you are qualified, and suddenly you must attend senior meetings, you must make decisions, but you've never been technically trained in terms of…' (FP 1)

Self-directed learning

Family physicians and registrars thought that learning occurred during registrars' self-directed learning activities such as self-learning, reflection, feedback and compiling their learning portfolio. Both groups of participants varied in their opinions on registrar learning behaviours, approach to feedback, reflection and utilisation of a learning portfolio.

Self-learning

Some FPs felt that some registrars did well on self-directed learning, with exceptional efforts to keep up to date with current knowledge. In contrast, other registrars failed to understand the self-directed learning process and struggled to manage it:

'So, it's not something that you can generalise. So, it's actually varied. There are some who are independent; they do their work, and quality work and they come, and then you really see that this person knows what they're doing. But then there are some who are just completely off; they just don't have a clue what they're doing, and they are problematic.' (FP 11)

One FP commented that registrars believed they knew what adult education was when they did not:

'A lot of them assume they know what (the) adult education model is. But I don't think they do. I think they feel adult education is about staying back and doing everything on their own, and that's not it.' (FP 9)

On registrar learning behaviours, FPs in some districts felt registrars displayed variable behaviours:

'There is always one or two who struggle, and it's likely we know because we easily identify them and work on it, but often it's not successful.' (FP 6)

In contrast to this, others thought that registrars were committed and improved their behaviour:

'It's exceptional. They're committed to learning. I'm impressed with their learning behaviour, and I'm impressed with their dedication. They have really improved tremendously, and they are willing to learn as well.' (FP 4)

The FPs in some districts commented on the lack of professionalism and work ethic, but opinions varied among FPs:

'So, there are good people [*who*] really go the extra mile. And then there are other registrars that have [*a*] poor work ethic and complain a lot, and don't get the work done, so we're definitely working with different personalities.' (FP 7)

In contrast, all the registrars believed they had good learning behaviours and work ethic, were willing to learn, and participated in various registrar activities:

'I think I'm always willing to learn, and I'm always willing to be part of what needs to be done, and if there's training, I'm always looking forward to it and I'm also contributing if needed to, and I'm not being pushed.' (RG 9)

Learning portfolios

All registrars and FPs agreed that a learning portfolio is an exceptional tool to support self-directed learning, providing ample guidance on learning objectives and how to achieve them:

'So it serves as a guide to me, and it serves also as a check book [*sic*] where I can always go back and see which objectives or learning plans I have set, and if I'm still on track with those learning plans, and if I've managed to achieve those objectives, and if I'm satisfied with the achievement that I have, or if I'm lagging behind and I might not achieve what I set for myself as a goal.' (RG 6)

Despite being identified as a good learning tool, most registrars and FPs agreed that adequate utilisation of the portfolio by registrars was problematic. Often, portfolios were regarded as last-minute paper-based exercises when they had to be submitted and were not used to stimulate deeper learning:

'It's not something that we are putting emphasis on or sort of… we don't really use that to guide us. We sort of more keep note of what the deadlines are and try to keep up to them. So, it's more a deadline-driven process, I would think, rather than sort of using it as a material to guide us.' (RG 7)

Feedback

Registrars felt that they incorporated feedback, whether positive or negative. They felt encouraged by positive feedback and viewed negative feedback as a learning opportunity to address deficiencies:

'So, it depends on whether it's positive or negative feedback. So, if it's negative feedback, that means I'm going to have to go

[*and*] read more, or to improve in whatever the remark or the feedback was [*about*]. And if it's positive feedback, you feel encouraged.' (RG 4)

Some registrars disclosed that they struggled to incorporate feedback when they started the programme:

'I was actually very frustrated by some of the feedback when I first started because there was a lot of negative feedbacks and… [*laughs*] and left me frustrated. I remember going to one of my fellow registrars and, oh, I want to cry, I feel frustrated in the programme, because everything I get is negative; it's almost like I don't do anything right.' (RG 3)

Some FPs thought most registrars could engage with feedback more and act accordingly. They said that registrars kept repeating the same mistakes, implying that they failed to understand the feedback:

'Sometimes, to be very honest to you, not 100% effective. Many of them still struggle with incorporating the feedback with regards to improving, that's the thing, that's what I can tell you. Because I see that, sometimes I say, but I told you this last time and I gave you this feedback and all that.' (FP 3)

Reflection

Family physicians believed that more reflection on their patients and the feedback they received could provide better opportunities for self-directed learning, instead of the variable reflection they thought was being undertaken:

'The reflection is something that is also a little bit neither here nor there. Because if you see…you give a registrar feedback and then when he comes next time and the same problem crops up, then you begin to realise actually this registrar did not reflect on the feedback that you give.' (FP11)

In contrast, registrars believed that they reflected on supervisor feedback, especially on the strengths and challenges addressed, and they attempted to improve themselves in future patient encounters:

'But we have to reflect on what feedback we're given in terms of our strengths, our weaknesses, what we're doing well, what we're not doing well, and then you reflect on that and try and improve your skills around the weaknesses that you are facing.' (RG 1)

Contextual influences on learning opportunities

Registrars and FPs agreed that the learning environment was conducive to learning, with adequate patient numbers and various levels of hospitals, but the resources were variable. Contextual challenges included excessive workload, a lack of adequate support from district management and the university, and a lack of standardisation, negatively influencing registrar learning.

Training across different facilities promotes learning

Both participant groups agreed that training across various district health facilities, including PHC clinics and district and regional hospitals, allowed access to patients with different sociodemographic characteristics and high burden of disease, which added to the richness of the learning environment:

'We have the district hospital and then you have the PHCs, and then we have the regional hospital. So, when we are at [*sic*] the district we're able at least as registrars in family medicine, we're able to see cases that are sometimes then referred from the regional hospital, and it gives you an idea what is for the district hospital, which cases are supposed to go to.' (RG4)

'We're in a district where more than 45% of adults are unemployed. So, the social determinants of health, they are [*visible*] here; if there's any place where they impact, it's here. So, the burden of disease, the environment, is good for learning.' (FP 9)

One registrar commented that she got better learning opportunities in smaller hospitals with a stronger primarycare focus, compared with bigger hospitals:

'I wouldn't maybe learnt as much as I've learnt in these three years, by not given the opportunity and being put into the position, in such small facilities where you have to learn to, number one, make do with what you have, and you have to teach yourself and you need to make sure that you are up to date.' (RG 8)

Variable resources impede learning

Family physicians agreed that FP numbers had improved during the years in some districts, which was encouraging, but there was still a challenge in other districts. Both participant groups commented on the variability of available human and material resources across the districts:

'I think in terms of the skills, like clinical, especially like OSCE skills, that sometimes is a little bit challenging because there's sometimes a lack of resources. You know, for example, there's no like speculums to do like a pap smear, or things like that.' (RG10)

'I think has improved over the years with regards … They have the materials, the mannequins, the books, the opportunities to learn with tools around in the clinics … everything is actually provided for them; it's just a question of the trainers.' (FP 3)

Excessive workload

Registrars and FPs expressed challenges of heavy workloads as part of service delivery, negatively impacting learning and requesting service delivery support from their workplace:

'Sometimes there are so much patient load [*sic*] at the clinic that most of the times we find ourselves doing service delivery more than learning. Then because there would be a shortage of staff, we also do clinical care, so that's a challenge.' (RG 5)

'Obviously, we want to develop registrars or specialists with tenacity. But where they are pushing queues, it's also a problem.' (FP 9)

District management and university support is essential

According to the FPs, registrars need support from the district management to promote learning. They wanted protected time for registrar learning and allowing clinical rotations at hospitals:

'They [*district management*] don't like this idea of registrar going outside for a clinical rotation, because they feel we're reducing the staff that provide clinical service at primary health care

> [*clinics*]. So, there's been this on-going rift that the district is paying the registrars but they're working in the hospital. And they tend not to understand that this is a training programme.' (FP 4)

Family physicians requested university engagement to create awareness about FM training in the district, which could augment learning opportunities:

> 'I think Wits [*University*] needs to come in here and assist us so that if they can talk at a higher level and say, look, the registrars are at training, much as they are part of the workforce but they need to be … people need to understand that their quality of work, or whatever they are doing, needs to be linked with their objective, which is learning.' (FP 11)

Meanwhile, registrars appreciated accessibility to university resources such as the library:

> 'I think that we have access to the resources and references via the Wits Health Sciences library, and so whatever I do, I can always go back and review the best standard practice.' (RG7)

District learning opportunities need to be standardised

Some registrars and FPs emphasised that registrars' learning in the districts was variable, and there was a need to standardise learning opportunities:

> 'I'd love a structured approach, or even, can I say, a global structure. Almost to know what are other districts doing? Like are we behind, are we forward? Where are we in terms of everyone else? Like a universal plan … like I know you can't, you can't universally make every district do the same thing, but it would be nice to know what the other districts are doing to see relative to what are we doing.' (RG 11)

Discussion

This study identified multiple types of learning opportunities for registrars, including interactions with various groups of people, participation in district activities and self-learning strategies. However, the WBL opportunities available were used variably both within and across districts. Compared with previous studies from high-income countries, this study in a middle-income country contributes a different perspective on what is needed to enhance WBL in authentic clinical settings of PHC.

Regular interactions with complex and undifferentiated patients in authentic clinical settings provided WBL opportunities. Patient engagements and reflections from those interactions are considered among the best WBL strategies for trainees.[12,16,19,23,27] Registrars learned by integrating the FM principles, reading about patients' conditions and developing self-directed learning behaviours. Patient interactions also helped registrars to practice more soft skills, including communication skills, clinical reasoning and professional behaviour.

Registrars had adequate opportunities to learn from peers and FPs in most districts. Peer learning interactions and sharing views and experiences among trainees in different years are recognised WBL strategies.[27] Interestingly, peer learning opportunities identified only by the supervisors underscored the importance of intergenerational learning, which was not recognised by registrars. Family physicians thought registrars were more pressurised to learn when they identified knowledge gaps in the presence of peers, as found elsewhere.[19] Previous studies perceived that learning from peers was more acceptable for registrars than from supervisors, as supervisor presence could interfere with a safe learning environment.[19] In contrast, interactions with FPs were identified as excellent opportunities for registrar reflections on their strengths and weaknesses. Family physician accessibility during and after work hours encouraged registrars to integrate the FM principles or tools, positively influencing WBL. Interactions with peers and supervisors provide excellent learning opportunities[12,18,19,48] and constitute examples of situated learning.[49] Role modelling could potentially demonstrate excellent clinical teacher, human and professional behaviours[50] and has a greater impact on trainees to internalise those behaviours than any other teaching method.[51] A lack of role-modelling opportunities hindered WBL in this study, as identified elsewhere.[20] Peer teaching[48] and supporting trainers are also essential to optimise WBL opportunities in clinical settings.[3]

Participants identified learning from other types of professionals as essential for WBL. Previous studies in high-income countries showed that learning occurs between health professionals during workplace interactions.[18,19,20,21,22,23] Interprofessional learning between various health professionals working in collaboration is a WHO recommended strategy to address health systems challenges worldwide.[52] According to most participants, although interprofessional learning was a good learning opportunity, it was insufficiently utilised. Trainees were often reluctant to spend time learning from other professions, perhaps because they felt it was not part of their assessments. Other reasons could be the non-recognition of others' expertise, professional stereotypes and hierarchical challenges.[16,53] Workplace-based learning opportunities from other professions varied across clinics and district hospitals, and registrars identified more opportunities at the district hospital. For example, dietary advice offered by dieticians could be observed and utilised by the registrars for managing a diabetic or hypertensive patient. Similarly, basic or advanced counselling skills learnt from a psychologist could be applied to patients with mental-health illnesses while practising holistic care. A recent SA study reiterated the importance of trainees' learning from other professions, as it improves collaboration and teamwork, professional satisfaction and patient care.[54]

The availability of a range of other learners has been found to enhance learning opportunities.[26,51] The participants in this study reported that registrar training of students and staff enhanced learning by providing them with a platform to gain practical experience towards becoming an effective trainer, an expected FP role in SA.[55,56]

In WBL, self-directed learning, reflection, and the ability to incorporate internal feedback at expected standards and external feedback from peers or supervisors[15] are vital for trainee personal and professional development.[16,57] Reflection is essential to learning from experience[57] and it develops registrars as lifelong learners.[58] Incorporating feedback, reflection and self-directed learning skills were variable among the registrars in this study, as perceived by FPs, but registrars thought they integrated feedback sufficiently into their learning. The ownership for self-directed learning, looking actively for learning opportunities, reflection and feedback, improves during training because of trainees' increased awareness.[28] The senior registrars in our study commented more than juniors on their reflection-on-action, on patient interactions after their daily work, looking into the supervisors' feedback and addressing knowledge gaps. Despite these processes being only learnt during training, FPs expected registrars to engage with feedback and reflection from the time they joined the programme, as found previously.[28] Instead, supervisors could provide more guidance to registrars with various WBL strategies earlier in their training. The participants agreed that workplace artefacts such as learning portfolios, case logs and reflective logs were excellent WBL tools, as seen in other studies.[16,30] The portfolio was only used as a last-minute paper-based exercise for yearly submission but was not efficiently engaged for deeper learning by reflection.[30] Learning portfolios augment trainees' long-loop learning by engaging supervisors or peers when challenged by complex patients,[12] which was not evident in this study.

Compared with previous SA studies,[30] workplace-based learning opportunities occurred during patient interactions, integrating feedback and FP engagements. Additional enablers in this study were peer learning, student training, and attending district activities such as CME and mortality and morbidity meetings. Learning occurred when exposed to patient loads based on community needs, experience with undifferentiated and holistic care and adequate hands-on practice, as found before.[59] Resource challenges and a lack of district and university support[29] also emerged as findings. Participation in district clinical activities was a major contributor to WBL, including community-oriented primary care, mortality and morbidity meetings and quality improvement projects. There were primary planned opportunities with FPs, but secondary opportunities occurred while engaging and immersing in the clinical workplace during patient interactions, as described in studies conducted in high-income countries.[60] While FPs are expected to fulfil leadership and governance roles in SA,[6] this study showed that registrars were not provided sufficient opportunities to learn or practice leadership and governance roles during training.

Self-directed learning behaviours and professionalism were variable among registrars, although FPs and registrars differed in their opinions. Trainees' self-motivation[17] and positive approach to feedback augmented self-directed learning.[12] Self-directed learning and professional behaviours are essential registrar competencies and part of the national programmatic learning outcomes.[6] Professionalism and self-directed learning are critical competencies to be attained by postgraduate FM trainees in many high-income countries (as prescribed in the Canadian competency FM framework[4,5] and Accreditation Council for Graduate Medical Education [ACGME] Program Requirements for Graduate Medical Education in FM[3]). The availability of more explicit guidelines on programme requirements explaining how decentralised clinical training should be implemented would assist in a more standardised approach, as performed in high-income countries.[3,5] More explicit guidelines on registrar professionalism, supervisor roles and characteristics, and supervisor–trainee relationships could be included.

A supportive learning environment requires good supervision opportunities and mutual observation, including modelling during practice, provision for narrative feedback, sufficient resources, additional organisational support, a manageable workload and time to reflect on patient interactions,[13,25] which were found challenging in these settings. To optimise WBL, the learning environment should have a manageable workload and should address trainees' well-being.[3,12,51] The need for protected time is necessary, as work pressure impedes WBL.[26,27,51] District management support is imperative for the growth of decentralised clinical training sites,[28] which were also challenging, according to participants. Inadequate FP trainers and material resources, such as essential equipment and mannequins, negatively impacted WBL. Adequate material resources, including training space with adequate lighting, less background noise, comfortable seating arrangements and equipment availability, are all prerequisites for a conducive learning environment,[15,26,27,51] the lack of which were found to be barriers.

The findings underscore the need for ongoing faculty development of supervisors focused on enhancing teaching and learning. Clinical educators typically have not undergone educational training in preparation for their supervisory roles and may thus have little understanding of relevant learning theories such as social learning theory[61,62] or how to promote self-directed learning. There needs to be greater awareness around and more opportunities for FPs to attend training that influence WBL and supervision. The courses are offered by the SA Academy on areas such as postgraduate supervision, supervisory feedback, WBL and WPBAs. Participation in fellowship or masters' programmes offered by the university could also improve clinical trainer skills as medical educators. Peer mentoring for personal and professional growth among trainers and trainees while working as a team in their workplace contexts should be encouraged. Faculty development should involve both 'local faculty' and 'extended faculty'[63] such as medical practitioners, nurses and multidisciplinary team members who play beneficial roles in registrar WBL enhancing interprofessional learning. For registrars, how to best utilise WBL opportunities by applying adult learning principles, feedback engagement

and more reflective behaviours should be introduced and engaged earlier in their training.

Study limitations

Exploring the WBL opportunities in decentralised sites of one university may have affected the transferability of the results to other similar contexts, although it is possible to some extent in case studies.[36] Previous experience with the study contexts for the primary researcher may have influenced the data collection and analysis, but measures were taken to minimise this.

Recommendations

Based on this study, we recommend maximising WBL opportunities and addressing contextual challenges for registrars. Peer learning and more supervisory engagement with mutual observation during trainees' clinical practice need to occur. Adequate usage of the learning portfolio as a reflective tool, reflection on the supervisor's feedback, and utilising interprofessional learning is encouraged. Participation in multiple FP roles and responsibilities, such as leadership and governance and staff and student training by registrars, can be more frequent. We recommend sufficient organisational support from district management and the university and improved resource availability to enhance WBL opportunities across individual sites. More explicit guidelines or policies on decentralised training programme implementation nationally could assist in optimising and even standardising WBL opportunities.

The in-depth understanding of WBL opportunities derived from this study will be integrated as a 'process' in the evaluation of the FM training programme using logic model. These findings, together, with those from other parts of the larger study (resource availability, postgraduate supervision and supervisory feedback)[32,33,34] will be evaluated as the inputs, processes and outputs of the logic model. The overall logic model improved understanding of these factors and their relationships, which will be utilised for improving the programme as a whole.

Conclusion

This study was an in-depth exploration of perceptions of postgraduate learning opportunities for FM training in the clinical workplace in SA. Self-directed learning, peer learning, student training and participation in district activities were identified as strengths. Interaction with supervisors, peers and other professionals could augment WBL opportunities. More reflection on supervisory feedback, registrar professionalism, learning portfolio utilisation and interprofessional learning is needed. Well-resourced facilities and exposure to various complex patients promote WBL, while excessive workloads, inadequate resources, and insufficient district management support impede learning. Strengthening the utilisation of available opportunities while addressing the challenges can maximise WBL in decentralised sites. Optimising learning opportunities in clinical environments provides superior learning experiences at sites, translating to better patient healthcare within communities. This study provides several areas for future research. Not only does it underscore the need for ongoing training programme evaluation, it creates possibilities for exploring the influence of respondents' background on WBL and cross-case analyses of WBL across different training districts and sites, both nationally and internationally.

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Competing interests

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Authors' contributions

N.J.E. conceptualised the research, collected and analysed the data and wrote the first manuscript draft. N.J.E., A.Z.G. and L.J. contributed to the data analysis, developing the themes and writing the subsequent drafts. All authors contributed to the development of the manuscript and approved the final version of the manuscript.

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Data availability

Data are available upon reasonable request from the corresponding author N.J.E.

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CHAPTER 7. EVALUATING POSTGRADUATE FAMILY MEDICINE SUPERVISOR FEEDBACK IN REGISTRARS' LEARNING PORTFOLIOS

7.1. INTRODUCTION

This original research article was published in the **African Journal of Primary Health Care and Family Medicine:**
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This article presented the findings from the evaluation of supervisory feedback in registrars' learning portfolios, which was evaluated as an 'output' in the logic model in this study.

I presented this research at the 24th National Congress of South African Academy of Family Physicians, hosted in Cape Town, South Africa, in August 2022.

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Evaluating postgraduate family medicine supervisor feedback in registrars' learning portfolios

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Background: Postgraduate supervision forms a vital component of decentralised family medicine training. While the components of effective supervisory feedback have been explored in high-income countries, how this construct is delivered in resource-constrained low- to middle-income countries has not been investigated adequately.

Aim: This article evaluated supervisory feedback in family medicine registrars' learning portfolios (LPs) as captured in their learning plans and mini-Clinical Evaluation Exercise (mini-CEX) forms and whether the training district or the year of training affected the nature of the feedback.

Setting: Registrars' LPs from 2020 across five decentralised sites affiliated with the University of the Witwatersrand in South Africa were analysed.

Methods: Two modified tools were used to evaluate the quantity of the written feedback in 38 learning plans and 57 mini-CEX forms. Descriptive statistics, Fisher's exact and Wilcoxon rank-sum tests were used for analysis. Content analysis was used to derive counts of areas of feedback.

Results: Most learning plans (61.2%) did not refer to registrars' clinical knowledge or offer an improvement strategy (86.1%). The 'extent of supervisors' feedback' was rated as 'poor' (63.2%), with only 14.0% rated as 'good.' The 'some' and 'no' feedback categories in the mini-CEX competencies ($p < 0.001$ to $p = 0.014$) and the 'extent of supervisors' feedback' ($p < 0.001$) were significantly associated with training district. Feedback focused less on clinical reasoning and negotiation skills.

Conclusion: Supervisors should provide specific and constructive narrative feedback and an action plan to improve registrars' future performance.

Contribution: Supervisory feedback in postgraduate family medicine training needs overall improvement to develop skilled family physicians.

Keywords: decentralised training; family physician; feedback; individualised learning plan; learning portfolio; postgraduate supervision; mini-Clinical Evaluation Exercise.

Introduction

Feedback is a vital aspect of supervision in clinical settings.[1,2] Feedback is defined as 'a way the trainee comes to know about the gaps in their current level of knowledge and the desired goal'.[3] For maximum effectiveness, feedback should be provided timeously, in small, manageable quantities, relate to observable behaviours[4] and should be tailored to the trainee's learning needs and non-judgemental.[5,6] Feedback must also be clearly articulated based on trainee's observed performance,[7] promote self-assessment,[8] be context-specific, enable interactions between the trainee and supervisor[3] and focus on adequate performance and areas for improvement.[9,10] Supervisors should assist trainees in developing written action plans specifying the supervisor's role in supporting trainees to achieve the goals outlined in the learning plans.[9,10] More recent definitions regard feedback as a coaching activity where supervisors facilitate trainees' self-reflection to improve performance.[10,11] However, the acceptability of feedback by trainees still depends on who provides it, whether it is constructive, the trainee's assessment literacy and the nature of supervisor-trainee relationships.[5,11]

The role of feedback in postgraduate family medicine training

Postgraduate family medicine decentralised clinical training of FPs involves educational and clinical supervision, each of which can be demonstrated in trainees' learning portfolios (LPs). Educational

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supervision includes identifying trainees' learning objectives and providing feedback on their personal development plans and progress in their LPs.[12,13] Clinical supervision involves giving feedback on trainees' relationships with staff and patients, their management of clinical conditions and their professionalism.[14] The LPs provide evidence of trainees' observed performance by clinical supervisors using workplace-based assessments (WPBAs),[15] using tools such as the mini-Clinical Evaluation Exercise (mini-CEX) form.[16]

Educational supervision in learning plans

Individualised learning plans in LPs are recognised as essential components of self-regulated lifelong learning,[17] which refers to trainees' ability to modify their thinking behaviour and level of motivation.[18] Learning plans are essential tools for postgraduate trainees, assisting them with understanding their strengths, professional goals and the family medicine speciality requirements needed to make individual adjustments and identify resources to progress.[19] The educational supervisor's role in the learning plans is to orientate trainees to the learning environment, help them set goals and objectives and plan feedback sessions.[6]

Learning plans can also promote self-directed learning, which differs from self-regulated learning. In self-directed learning, trainees develop their learning goals, identify activities and resources to achieve them and get external feedback to modify learning. By comparison, in self-regulated learning, the trainers set the goals, and trainees regulate their learning, influenced by their cognitive domain, which primarily happens in an academic environment.[20] However, there is a lack of literature on self-directed learning,[20] especially on the potential for learning plans to promote self-directed learning based on the quality of the feedback provided. The self-directed learning goals trainees develop in these plans must be meaningful, specific, measurable, accountable, realistic and include specified timelines.[21] While internal accountability facilitates self-reflection, trainees' external accountability requires regular supervisor feedback.[21]

Clinical supervision in the mini-Clinical Evaluation Exercise

The mini-CEX tool[16] is widely used in HICs to assess clinical competencies.[22,23,24] Although this tool was modified to accommodate several scoring systems, clinical disciplines and settings,[5,22] more contextualised studies are needed to understand its effectiveness in resource-limited settings. One of the primary purposes of the mini-CEX form is to provide structured feedback on observed performance.[5,22] The educational impact of this tool[24] is enhanced when combined with well-written feedback[25] and negatively impacted by inadequate feedback.[5,23] Supervisors often provide inadequate feedback by, for example, not appreciating or being aware of the role of feedback as an educational tool, not being skilled enough to provide helpful feedback, and tending to give high numerical scores (superior or satisfactory) on each mini-CEX competency,[25] without explaining why this score is justified. Trainees value narrative feedback more than numerical scores-narrative feedback helps them to distinguish between performance deemed 'good' and 'not so good', promotes reflection on their performance,[26] and develop an action plan.[27]

In sub-Saharan Africa, clinical supervisors play a crucial role in postgraduate training in the workplace.[28] Clinical supervisors are expected to provide constructive, good-quality verbal and written feedback during WPBAs. An evaluation of supervisors' feedback in registrars' LPs at a South African university showed that feedback was better documented in e-portfolios than in paper-based ones but was still not sufficiently specific.[29] A satisfactory LP is a prerequisite for registrars (trainees) to sit the national exit examination to qualify as an FP.[30] One of the challenges of tools such as learning plans or mini-CEX used in LPs is that they assess 'hard' skills (history-taking, physical examination and management) and 'soft' skills (problem-solving, communication, collaboration and professionalism).[20] While some received training in providing feedback in South Africa,[31] many FPs may not know what constitutes adequate feedback, which is more complex for 'soft' skills.

Evaluating feedback in learning plans or the mini-CEX tool is still in its infancy in various high and low-middle income countries in clinical settings, including sub-Saharan Africa. It has been identified as an area for further research.[20,27] This article evaluated both the quantity and quality of supervisory feedback and the scores given in registrars' LPs as captured in their learning plans and mini-CEX forms. The article also reports whether the training district or year of training affected the nature of the feedback across the decentralised clinical training sites. The results could help develop recommendations for improving educational and clinical supervision feedback in similar settings nationally and across sub-Saharan Africa.

Research method and design

Study design and setting

This study is part of a broader cross-sectional, convergent mixed-methods study that evaluated postgraduate family medicine training at five decentralised training sites affiliated with the University of the Witwatersrand in South Africa, using the logic model. The logic model is causal, based on the reductionist theory that links the inputs, processes, outputs and outcomes.[32] A previous publication from the broader study reported evaluating postgraduate supervision as a process in the logic model.[33] This article reports evaluating supervisors' feedback as a proxy measure for effective supervision as an output in the logic model. In the setting for this study, registrar training is primarily based in primary or community healthcare clinics or a district hospital. During clinical rotations, registrars join various disciplines for 3 months or less in regional hospitals to gain specific knowledge and skills. Family medicine registrars are primarily supervised by FPs but may be supervised by non-family physician (non-FP) supervisors during clinical rotations. The non-FP supervisors could be specialists, registrars in other disciplines, or medical officers.

Medical officers are general practitioners working at hospitals or clinics without any specialist registration.

Family physician training for their supervisory role varies. Some FP supervisors had attended 'train the trainer' courses conducted by the South African Academy of FPs. Others had opportunities to attend the courses organised by Wits University but were not trained formally in medical education. The background of the non-FP supervisors in medical education training was not well understood at the time of this study. Family physicians act as educational supervisors and mentors, assess registrars' learning plans and provide feedback during clinical rotations. In addition, as part of WPBAs, FP supervisors complete mini-CEX forms during directly observed consultations by registrars with patients in clinical settings. Supervisors' written feedback in the learning plans and mini-CEX forms provides evidence for the quality of clinical and educational supervision.

This study evaluated the written feedback in registrars' LPs from the five decentralised training sites, four of which are in Gauteng province and the fifth in the Northwest province.

Study population and sampling

All LPs submitted in 2020 by the 20 registrars across all 3 years of training were eligible for evaluation, constituting a purposive sample.[34] Thirty-six learning plans and 57 mini-CEX forms were evaluated from 19 eligible LPs. One portfolio was excluded as there was no consent. The learning plans and mini-CEX forms represented all 5 training districts (D1–D5) and 3 years of training (Y1–Y3).

Data collection

The authors evaluated the learning plans and mini-CEX forms between October and December 2020.

Learning plans

At the beginning of a clinical rotation, the registrar develops goals in their learning plan. The supervisor then provides initial feedback on these goals. At the end of the rotation, the supervisor assigns a global score for the registrar's knowledge, skills, professional values, and attitudes and provides final written feedback. A validated tool developed at a South African university[29] was modified to assess supervisors' final feedback in the learning plans. The tool was adapted in consultation with one of the co-authors, who developed the validated tool: variables were added to make it more comprehensive on each of the feedback categories extracted from the data, thus increasing the construct validity of the tool.

The modified tool consists of seven categories:

- feedback on registrars' professional behaviour
- feedback on registrars' knowledge and skills
- the valence of feedback
- the presence of an improvement strategy
- a rating of the extent of supervisors' feedback
- the signatory (FP or other clinical supervisors) on the initial feedback
- the signatory (FP or other clinical supervisors) on the final feedback.

The written feedback given by supervisors in the general feedback section was captured in an MS Excel spreadsheet to analyse the quality. The spreadsheet also recorded the training district, year of training and global numerical scores from each learning plan were also recorded in Microsoft Excel. The rating of the extent of feedback was classified as 'poor', 'average', or 'good' by the researchers, depending on the feedback aspects provided. The feedback was rated 'poor' if (1) feedback was absent or irrelevant (2) specific feedback was not provided for the following categories in the tool: professional behaviour, knowledge and skills, valence of feedback and improvement strategy present, (3) forms were not signed and completed by the supervisor. A rating of 'average' was assigned when specific feedback was provided on one or two of the categories (registrar professional behaviour, knowledge and skills, valence of feedback provided or improvement strategy) and forms were signed and completed. The rating was 'good' when feedback was provided for three or more categories (registrar professional behaviour, knowledge and skills, valence of feedback and improvement strategy) and the form was signed and completed.

Mini-Clinical Evaluation Exercise forms

The mini-CEX form requires supervisors to allocate individual scores for the competencies and provide a total score. The form includes sections for the supervisor's feedback and supervisor and registrar signatures.

We developed a feedback assessment tool to evaluate written feedback in the mini-CEX forms, whether explicitly related to the seven competencies or appearing in the general feedback section. The tool assessed the extent and adequacy of the supervisors' feedback, the training district, the year of training, and whether both FPs and registrars signed the form. The 'extent of feedback' rating was classified as 'poor', 'average', or 'good' depending on the areas of mini-CEX competencies addressed, whether supervisors had completed the general feedback section and whether the supervisor and registrar signed the forms. The scores for each of the seven competencies and total scores given in mini-CEX forms were recorded in Microsoft Excel. The narrative feedback provided in the general feedback section was captured in a separate MS Excel spreadsheet to analyse the quality.

Data analysis

The data were analysed for descriptive statistics using STATISTICA 13.5.0.17 and for associations using STATA 14.2. For the inferential statistics, the feedback categories were collapsed into 'some feedback' and 'no feedback' in both learning plans and mini-CEX forms. For both tools, the absence of feedback was categorised as 'no feedback', and all other feedback categories were grouped as 'some feedback'.

Similarly, if the rating of 'extent of supervisor's feedback' was 'poor', this was categorised as 'no feedback', and the 'average' and 'good' categories were grouped into a single category labelled 'some feedback'. All associations between 'no feedback' and 'some feedback' categories and the training district or the year of training were determined using Fisher's exact tests ($p < 0.05$). Fisher's exact tests were used rather than chi-squared tests because of the small sample size.[35] Where there was a statistically significant association, Fisher's exact tests were used to test each training district and year with the 'some feedback' and 'no feedback' categories to determine the strength of association.

Kruskal–Wallis tests were used to compare the global and total scores in the learning plans and mini-CEX forms across the training district and year of training. Two-sample Wilcoxon rank-sum tests were used to test the strength of association. Bonferroni correction was applied for 2X2 training district and year of training comparison with feedback categories and scores and significance for the *p*-value was set at < 0.005 and < 0.017, respectively.

The feedback was first characterised according to length, that is, the number of words, overall quality and specificity to evaluate the quality of written narrative feedback in both forms. The characteristics assessed for the overall feedback quality in this study were extracted from validated tools used in previous studies. The following feedback quality characteristics were adapted from De Swardt et al. (2019) the number of words in the feedback, whether proper sentences were used, strengths and weaknesses highlighted and areas of improvement specified.[29] The following were derived from Pilgrim et al.: whether an action plan was provided and whether the feedback was specific.[36] For example, if the feedback simply read 'satisfactory' or 'good', it was coded under non-specific feedback. The second level of analysis involved content analysis[37] to derive counts for specific feedback areas. For example, the feedback 'the joint examination was performed well' was coded as 'used proper sentences' and 'provided strengths' under the overall quality. This feedback example was coded in the category 'physical examination' during the content analysis. The main author and co-authors initially separately, coded the data set, then compared their coding systems. Any differences were discussed until agreement on the naming of codes and categories and the categorisation of the codes was reached. The coding process was iterative, involving several cycles of discussions until the data analysis was completed. The iterative process improved the interrater reliability of the findings.[38]

Ethical considerations

Ethical approval for the broader project was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (certificate number: M191140). Permission to conduct the research was obtained from the University Registrar and the Head of the Department of Family Medicine. Informed written consent to access the LPs was obtained from registrars and supervisors.

Results

When the feedback in the 36 learning plans was analysed, most (61.2%) did not refer to registrars' clinical knowledge or skills, and 86.1% did not offer an improvement strategy. The 'extent of supervisors' feedback' was mainly rated as 'poor' (47.2%) or 'average' (47.2%); only a few (5.6%) were 'good'. In one-third of the forms, the final feedback was provided by non-FP supervisors from other clinical departments (Table 1). The data were not uniformly distributed, so the global score median of 8.0 (7.7–9.0) out of 10.0 in the learning plans was calculated.

In 17 of the 19 LPs, the mini-CEX forms were completed by more than one FP from the same district, while the same FP completed the remaining two. For the 'extent of supervisors'

TABLE 1: Learning plan feedback characteristics ($N = 38$).

Variable	*n*	%
Training district		
District 1	10	27.7
District 2	6	16.7
District 3	6	16.7
District 4	8	22.2
District 5	6	16.7
Year of training		
Year 1	10	27.8
Year 2	16	44.4
Year 3	10	27.8
Reference to registrar's professional behaviour		
No feedback	15	41.7
General feedback	8	22.2
Specific feedback	13	36.1
Reference to registrars' clinical knowledge or skills		
No feedback	22	61.2
General feedback	7	19.4
Specific feedback	7	19.4
Statement indicating valence of feedback		
No feedback and/or unclear	15	41.7
Mostly positive or negative	20	55.6
Constructive feedback (positive balanced with negative)	1	2.7
Comments offering an improvement strategy		
No feedback	31	86.1
General feedback	3	8.3
Specific feedback	2	5.6
National unit standards	0	0.0
Initial feedback given and completed by		
Family physician supervisor	24	66.7
Academic coordinator	8	22.2
Other specialists	1	2.8
Medical officer	0	0.0
Not signed	3	8.3
Final feedback given and completed by		
Family physician supervisor	16	44.4
Academic coordinator	8	22.2
Other specialists	8	22.2
Medical officer	4	11.2
Rating of the extent of supervisors' feedback		
Poor (No feedback; irrelevant feedback; no specific feedback on at least one aspect; not signed and completed)	17	47.2
Average (average or good feedback on one to two aspects; signed and completed)	17	47.2
Good (gives feedback on three or more aspects; signed and completed)	2	5.6

feedback', 63.2% were classified as 'poor' and only 14.0% as 'good' (Table 2). The median of the total scores in the mini-CEX forms was 6.8 (range: 6.1–7.3). Most of the mini-CEX competency scores given by FP supervisors ranged between 5–7 or 8–10, with very few scores of 1–4 (Table 3).

Further analysis showed a statistically significant association of the 'some feedback' and 'no feedback' categories with all Mini-CEX competencies ($p < 0.001$ to $p = 0.014$), the rating of 'extent of supervisors' feedback' ($p < 0.001$) and the 'signed by registrar and supervisor' ($p < 0.001$) categories with the training district (Table 4). However, there was no association with the year of training. There was no significant association of feedback categories in the learning plans with either the training district or year of training.

When the strength of association of D1–D5 with the feedback categories was tested further, D3 feedback rated higher when compared with other districts in all mini-CEX competencies with a statistical significance ($p < 0.001$ to $p = 0.003$). The 'extent of supervisors' feedback was also rated higher in D2 and D3 than D1, D4 and D5, which was significantly different ($p < 0.001$ to $p = 0.002$). D1 had significantly more signed and completed forms than D5 ($p < 0.001$).

Comparing the global scores in learning plans and total scores in mini-CEX forms with the year of training revealed significant differences in the median values of the global score ($p = 0.012$) and the total score ($p = 0.049$). On further analysis with two-sample Wilcoxon rank-sum tests, the differences were between Y1 and Y3 in both global score ($p = 0.003$) and the total score ($p = 0.016$). There were no significant differences between Y1 and Y2, or Y2 and Y3, across both forms. There were no significant differences in the median global and total scores across D1–D5.

The FP supervisors had provided the feedback in 22/36 learning plans, non-FP supervisors in 12/36 and 2/36 had no feedback. Non-FP supervisors provided more extended feedback (average of −25.8 words) than FP supervisors (average of −13.7 words). The feedback focused mainly on 'highlighting strengths' or was 'non-specific', with less emphasis on 'specific areas for improvement' and 'providing action plans' (Figure 1). The FP feedback focused only on registrars' 'work ethic' and 'clinical skills'. In contrast, non-FP feedback was more comprehensive because it referred to various areas, including 'professional behaviour' and 'teamwork' (Figure 2).

The FPs mini-CEX feedback focused on history-taking, comprehensive management and organisational efficiency. There was less emphasis on negotiation skills and comprehensive assessment (Figure 3). The average feedback by FPs in the mini-CEX forms (16.3 words) was longer than

TABLE 2: Mini-Clinical Evaluation Exercise feedback characteristics ($N = 57$).

Variable	*n*	%
Training district		
District 1	15	26.3
District 2	12	21.1
District 3	9	15.7
District 4	12	21.1
District 5	9	15.8
Year of training		
Year 1	18	31.6
Year 2	21	36.8
Year 3	18	31.6
General Feedback		
No feedback (1)	10	17.5
Feedback on areas performed well (2)	3	5.3
Feedback on areas not performed well (3)	4	7.0
Areas performed well and not well (4)	5	8.8
Offer strategies for improvement (5)	11	19.3
General or reference to national unit standards (6)	2	3.5
Combinations of 2–4 and 5	15	26.3
Combinations of 2–4 and 6	7	12.3
Rating of the extent of supervisors' feedback		
Poor (feedback on ≤ 2 areas of competencies; no general feedback)	36	63.2
Average (feedback on 3–4 areas of competencies; general feedback completed)	13	22.8
Good (feedback on five or more areas of competencies; general feedback completed)	8	14.0
Signed by registrar and supervisor		
Completed	29	50.9
Not completed	28	49.1

TABLE 3: Feedback characteristics and scores on mini-Clinical Evaluation Exercise competencies ($N = 57$).

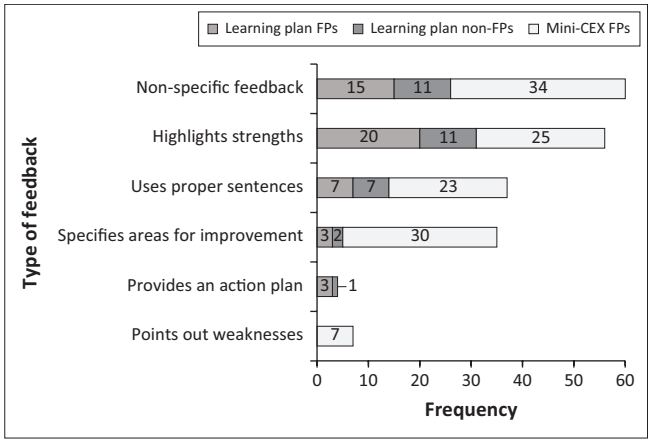
Mini-CEX competencies	Establish relationship		Gathering information		Physical examination		Clinical judgement		Explaining and planning		Shows organised approach		Overall competence	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Feedback categories														
No feedback	40	70.2	29	50.9	35	61.4	39	68.4	40	70.2	44	77.2	48	84.2
Feedback on areas performed well	10	17.5	12	21.1	8	14.0	10	17.6	10	17.5	4	7.0	3	5.7
Feedback on areas not performed well	2	3.5	11	19.3	12	21.1	7	12.3	4	7.0	7	12.3	4	7.0
Areas performed well and not performed well	1	1.8	4	7.0	2	3.5	1	1.8	1	1.8	0	0.0	0	0.0
Feedback general or inadequate	4	7.0	1	1.8	0	0.0	0	0.0	2	3.5	2	3.5	2	3.5
Score categories														
Score (1–4)	0	0.0	1	1.8	4	7.1	0	0.0	0	0.0	1	1.8	0	0.0
Score (5–7)	34	59.7	44	77.2	43	75.4	43	75.4	43	75.4	43	75.4	46	80.7
Score (8–10)	22	38.6	12	21.1	9	15.8	14	24.6	14	24.6	13	22.8	11	19.3
No score	1	1.8	0	0.0	1	1.8	0	0.0	0	0.0	0	0.0	0	0.0

Mini-CEX, mini-Clinical Evaluation Exercise.

TABLE 4: Association of mini-Clinical Evaluation Exercise feedback categories with training district and year of training.

Mini-CEX competencies	Training district										p†	Year of training						p†
	D1		D2		D3		D4		D5			Y1		Y2		Y3		
	n	%	*n*	%	*n*	%	*n*	%	*n*	%		*n*	%	*n*	%	*n*	%	
Establish relationship											< 0.001							0.128
Some feedback	1	4.5	4	3.6	8	2.7	3	3.6	1	2.7		2	5.4	8	6.3	7	5.4	
No feedback	14	10.5	8	8.4	1	6.3	9	8.4	8	6.3		16	12.6	13	14.7	11	12.6	
Gathering information											0.009							0.241
Some feedback	3	7.4	8	5.9	8	4.4	6	5.9	3	4.4		6	8.8	13	10.3	9	8.8	
No feedback	12	7.6	4	6.1	1	4.6	6	6.1	6	4.6		12	9.2	8	10.7	9	9.2	
Physical examination											< 0.001							0.466
Some feedback	3	5.8	9	4.6	7	3.5	2	4.6	1	3.5		7	6.9	10	8.1	5	6.9	
No feedback	12	9.2	3	7.4	2	5.5	10	7.4	8	5.5		11	11.1	11	12.9	13	11.1	
Clinical judgement											0.014							0.287
Some feedback	3	4.7	4	3.8	7	2.8	1	3.8	3	2.8		3	5.7	8	6.6	7	5.7	
No feedback	12	10.3	8	8.2	2	6.2	11	8.2	6	6.2		15	12.3	13	14.4	11	12.3	
Explaining and planning											< 0.001							0.765
Some feedback	0	4.5	6	3.6	8	2.7	2	3.6	1	2.7		6	5.4	7	6.3	4	5.4	
No feedback	15	10.5	6	8.4	1	6.3	10	8.4	8	6.3		12	12.6	14	14.7	14	12.6	
Show organised approach											<0.001							0.794
Some feedback	0	3.4	2	2.7	8	2.1	3	2.7	0	2.1		3	4.1	5	4.8	5	4.1	
No feedback	15	11.6	10	9.3	1	6.9	9	9.3	9	6.9		15	13.9	16	16.2	13	13.9	
Overall competence											< 0.001							0.902
Some feedback	0	2.4	3	1.9	6	1.4	0	1.9	0	1.4		3	2.8	4	3.3	2	2.8	
No feedback	15	12.6	9	10.1	3	7.6	12	10.1	9	7.6		15	15.2	17	17.7	16	15.2	
Rating of the extent of supervisors' feedback											< 0.001							0.932
Some feedback	2	5.5	9	4.4	8	3.3	2	4.4	0	3.3		7	6.6	8	7.7	6	6.6	
No feedback	13	9.5	3	7.6	1	5.7	10	7.6	9	5.7		11	11.4	13	13.3	12	11.4	
Signed by registrar and supervisor											< 0.001							0.944
Completed	1	6.8	6	5.8	4	4.3	7	5.8	9	4.3		9	8.2	10	10.1	8	8.7	
Not completed	13	7.3	6	6.2	5	4.7	5	6.2	0	4.7		8	8.8	11	10.9	10	9.3	

Mini-CEX, mini-Clinical Evaluation Exercise; D, district; Y, year.
†, Fisher's exact test, $p < 0.05$.



FPs, family physicians; non-FPs, non-family physicians; mini-CEX, mini-Clinical Evaluation Exercise.

FIGURE 1: Overall quality of feedback in learning plans and mini-Clinical Evaluation Exercise forms.

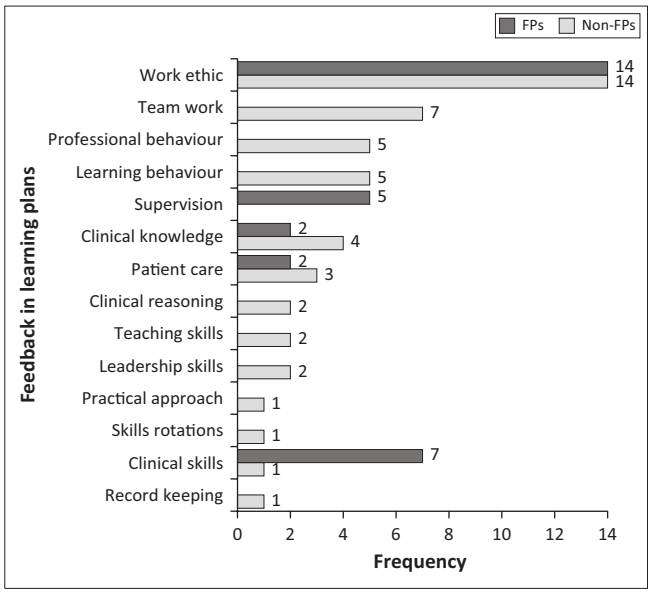
the learning plans (13.7 words). There was more emphasis on specifying 'areas of improvement' (per the overall quality evaluation) compared with the learning plans (Figure 1).

Discussion

This is one of the first sub-Saharan studies evaluating feedback in registrars' learning plans and mini-CEX forms as evidence of educational and clinical supervision. The general quantity and quality of the feedback across both forms were inadequate, which has implications for the registrars' ability to engage in self-directed learning.

The feedback in the learning plans lacked elements of effectiveness such as context specificity, being tailored to the trainee's needs and documented action plans. Other deficiencies were failure to focus on areas needing improvement, such as gaps in clinical knowledge, skills and professional behaviour and not specifying how the supervisor would assist the registrar in addressing these gaps. These findings were similar to previous studies where supervisors struggled to point out registrars' weaknesses or offer suggestions for improvement or action plans.[29] Given feedback's vital role in promoting self-directed learning,[18] the lack of focus on registrars' learning needs deprives them of opportunities to reflect on how they could improve their performance. As found previously, the written narrative feedback also minimally reflected registrar responses to feedback.[9,18]

Several studies evaluating mini-CEX forms in HIC[23,39] found that feedback focused more on adequately and less on inadequately performed areas and did not always include documented action plans. The findings of this study were similar, with a tendency for feedback to focus on adequate performance, highlighting strengths, and neglecting areas that needed improvement, with few action plans included. In



FPs, family physicians; non-FPs, non-family physicians.

FIGURE 2: Areas of feedback in learning plans by family physicians and non-family physicians.

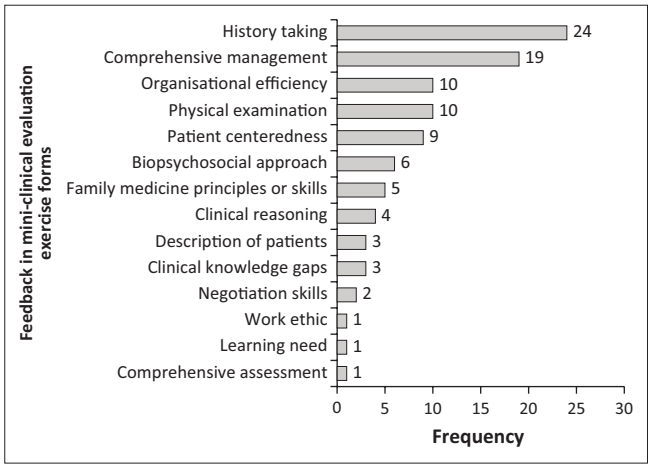


FIGURE 3: Areas of feedback in mini-clinical Evaluation Exercise forms by family physicians.

addition, written feedback was lacking in many of the forms. Mini-CEX forms have descriptors that guide structured feedback on observed performance,[8] but these were not used effectively. Possible reasons for supervisors not providing effective feedback could be their multiple roles and responsibilities[33] and the lack of protected time for educational activities,[40] especially for direct observations or their lack of skills or training.[5,17,39] The supervisors in this study often appeared reluctant to provide honest and negative feedback and grade trainee performance when it is poor, as has been seen in previous studies.[1,5] Other possible reasons for the poor supervisory feedback reported in this study could be deficiencies in trainers' knowledge and clinical competence, facilitation or interpersonal skills, and awareness of trainee's learning needs – all factors that have been described in other studies.[2,33] Organisational factors such as work demands, poor recognition for teaching activities and a lack of a conducive environment could also negatively affect feedback provision.[1] Some FP supervisors participated in training courses conducted by the academy or the university but ongoing training opportunities could capacitate them better than once off attending training.[41]

In the mini-CEX forms, instead of using competency descriptors, supervisors mainly provided global feedback or non-specific judgements such as 'satisfactory', which are vague and do not offer any educational value, as reported previously.[22,23,42] The inadequate space for written feedback on each competency resulted in supervisors recording feedback anywhere on the forms. The WPBA forms can be modified to so-called 'supervised learning events', as done in the United Kingdom,[43] in which text boxes can replace rating scales with tick boxes to provide narrative feedback. Modified mini-CEX forms with separate spaces to record areas performed well, those that need improvement, and action plans improve educational impact because they act as reminders for supervisors.[36,44] Although general descriptors offer a rough guide for providing feedback, modifying the forms to include the categories 'competent', 'not competent', and 'good' can guide supervisors to provide more specific feedback.[45]

Most FP supervisors scored highly on all mini-CEX competencies and total and global scores across all years of training. The lenient scoring was evident from the first year of training and did not exhibit the regular progression as seen in previous studies.[45,46] The global and total scores progression was evident only between the first and third years, in contrast to previous studies demonstrating score progression across all 3 years.[46] Ideally, feedback should be provided in the areas where registrars scored low. Insufficient supervisor feedback on the areas that scored low could lead to the registrar's self-assessing by over- or under-estimating their performance against expected standards.[8] Feedback should improve and be more holistic during the later years compared with the first year, where it could be limited to fewer competencies and be more specific. This avoids overloading junior registrars with feedback, allowing them to apply it in similar situations and enhancing transferability.[6] More than half of the mini-CEX forms were not signed by FPs or registrars, suggesting a lack of accountability from supervisors and registrars.

At the end of each clinical rotation, FPs and not non-FPs are expected to assess and provide feedback on whether registrars met the initial learning needs identified in their learning plans. Feedback provided by specialists and medical officers who functioned as educational supervisors may not have been aligned with training expectations. This could have been because of non-FP supervisors being unclear about the registrar's initially identified expected learning outcomes. A previous SA study also reported that registrars received more feedback from non-FP supervisors, which they found useful.[47] The role of non-FP supervisors in registrar supervision needs further research.

The reliability of WPBAs increases with multiple assessments conducted at various times by different assessors.[22,45] In this

study, registrars had multiple assessors in some districts, but, in others, the mini-CEX forms were completed only by their immediate supervisor. Clinicians functioning as supervisors in clinical settings are neither always trained in medical education[8] nor equipped to give meaningful feedback.[5,6] This could negatively impact registrar training, even more so in districts where only one supervisor provides feedback. Regular faculty development is needed to understand the educational value of feedback.[22,27] Identifying a core group of well-trained supervisors to provide feedback when conducting WPBAs[5] could be another strategy to address the reliability of mini-CEX assessments.[27]

Feedback in the learning plans focused on ethics, professionalism, clinical knowledge and skills and learning behaviours. This was in contrast to a study where professionalism was the learning goal least identified by trainees.[48] Feedback provided by specialists and medical officers was much more comprehensive, covered many competencies and was aligned to registrars' learning needs (Figure 2). Supervisors' ability to provide feedback on appropriate history-taking and physical examination skills is critical in workplace learning, as clinical diagnosis depends on these registrar skills.[5] Mini-CEX feedback mostly covered history-taking, physical examination, comprehensive management and organisational efficiency. Clinical reasoning was the least covered. This differed from previous studies where feedback focused least on professionalism and organisational efficiency.[49] As reported previously, there was no alignment of many feedback areas to the registrars' learning needs.[49] Family physicians provided scanty feedback on soft skills, such as clinical reasoning or patient negotiation skills (Figure 3). High scores given by FP supervisors on all competencies suggested insufficient skills to evaluate registrars critically, especially for soft skills. Ideally, more narrative feedback should be offered on identified learning needs where supervisors gave low scores.

This is the first sub-Saharan study to explore the significance of training sites and supervisor characteristics on the quality of feedback. While one district (D3) had fewer FPs involved in training, registrars received more comprehensive feedback than other districts with more FPs. This infers that feedback does not depend on the number of supervisors but is context-specific, dependent on willingness and effort, understanding of feedback characteristics[5] and assessment literacy.[7,22] All supervisors and registrars involved in decentralised clinical training require ongoing faculty development training on what constitutes adequate feedback to maximise this essential element of workplace-based training and assessments in decentralised settings. There are several training options that could supplement the existing training. One option is to conduct practical sessions using videos of actual registrar consultations and the supervisory feedback that could be critiqued by pairs or groups of FPs as done in other settings.[50] Another strategy could capitalise on the peer coaching or co-teaching[1] opportunities provided by observed consultations – pairs of junior and senior FPs should provide feedback to registrars after these sessions. Similarly, feedback sessions between FPs and registrars in combined sessions with medical students or interns at clinics or hospitals provide opportunities for registrars to practise and internalise effective feedback. Finally, and most importantly, FPs should promote an empathic learning culture based on constructive feedback, even at the lowest family medicine training level, at the primary healthcare facilities.

Limitations

Only written feedback was evaluated; verbal feedback during direct observations was not included. Scores and feedback were compared across the different sets of registrars in the three years but not for the same registrar across training years. Although it is difficult to make high-quality assessments in postgraduate training because of low numbers,[27] all registrars' portfolios were included to maximise participation. The principal author constantly engaged with co-authors on coding and analysis, improving internal and external validity. The study was conducted in the decentralised sites of one university, which could affect the generalisability of the results.

Recommendations

Given the integral role of feedback in effective clinical and educational supervision, we suggest there is a need to improve the feedback supervisors provide to trainees and how trainees utilise the feedback. Supervisors and registrars need regular faculty development on various aspects of effective feedback. Training for supervisors should focus on how to give specific feedback according to registrar performance, especially on softer skills such as clinical reasoning and professionalism, along with other hard skills such as history-taking and physical examination, how to develop action plans and assist in implementing the action plans. For the registrars, the training should focus on utilising the written feedback to develop as self-directed lifelong learners.

Conclusion

This study evaluated supervisors' feedback in family medicine registrars' LPs. Supervisor feedback was shown to be inadequate, often very general and not very helpful in developing action plans to improve registrars' skills. The lack of detail tailored to individual needs could negatively impact the training of health workers. Family physicians' supervisory role is vital to ensure the training of skilled family physicians to strengthen primary healthcare and district health systems, which should translate to better health outcomes in communities. Future research on feedback in postgraduate family medicine training programmes in similar contexts could help to improve the quality of this cadre of health professionals.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

N.J.E. conceptualised the research, collected and analysed the data and wrote the first draft of the manuscript. N.J.E., A.Z.G. and L.S.J. contributed to the data analysis, and revising the subsequent drafts. All authors contributed to the development of the manuscript and approved the final version.

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Data availability

The data that support the findings of this study can by made available by the corresponding author, N.J.E., upon reasonable request.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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CHAPTER 8. EVIDENCE OF LEARNING IN WORKPLACE-BASED ASSESSMENTS IN A FAMILY MEDICINE TRAINING PROGRAMME IN SOUTH AFRICA

8.1. INTRODUCTION

This original research article was submitted to the **South African Family Practice** journal and accepted for publication (Ref no: 5850).

This study looked for evidence of learning in workplace-based formative and summative assessments as recorded in the registrars' learning portfolios and examinations in the training programme.

Evidence of Learning in Workplace-based Assessments in a Family Medicine Training Programme in South Africa

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Abstract

Background: Learning portfolios provide evidence of workplace-based assessments (WPBAs) in clinical settings. The educational impact of learning portfolios has been explored in high-income countries, but the use of portfolios and the types of assessments used for and of learning have not been adequately researched in sub-Saharan Africa.

Aim: This study investigated the evidence of learning in registrars' learning portfolios and the influence of the training district and year of training on assessments.

Methods: A cross-sectional study evaluated 18 Family Medicine registrars' portfolios from study years 1-3 across five decentralised training sites affiliated with the University of the Witwatersrand. Descriptive statistics were calculated for the portfolio and quarterly assessment scores and self-reported clinical skills competence levels. The competence levels obtained from the portfolios and university records served as proxy measures for registrars' knowledge and skills.

Results: The total learning portfolio median scores ranged from 59.9 to 81.0, and quarterly assessments median scores from 61.4 to 67.3 across training years. The total learning portfolio median scores ranged from 62.1 to 83.5 and 62.0 to 67.5 in quarterly assessments across training districts. Registrars' competence levels across skill sets did not meet the required standards. Higher skills competence levels were reported in the women's health, child health, emergency care, clinical administration, and teaching and learning domains.

Conclusion: The training district and training year influence WPBA effectiveness. Ongoing faculty development and registrar support are essential for WPBA.

Contribution: This study contributes to the ongoing discussion of how to utilise WPBA in resource-constrained sub-Saharan settings.

Background

The World Health Organisation (WHO) advocates that medical training should develop socially accountable health professionals with the required skills.[1,2] Socially accountable medical training requires education and service activities that address the priority health concerns of the communities being served.[2] Trainees' 'social responsiveness,' an essential element of social accountability,[3] refers to their ability

to integrate the complex skills required to attend to patient needs and improve patient outcomes in the community.

The recent shift to work-based learning (WBL) and workplace-based assessment (WPBA) aligns with the call for greater social accountability in medical training. Training in authentic clinical contexts promotes professionalism, communication, teamwork and interprofessional collaboration and enhances self-directed learning, thus preparing trainees to be responsive to communities' needs.[4,5] Despite the benefits of WBL, medical schools may not be equipped to assess the complex integration of knowledge, skills, and attitudes in authentic settings and have been criticised for not linking the phases of trainee learning with patient outcomes.[5] The educational impact of WBL has been explored in high-income countries, but the use of WPBAs and the types of assessments used for and of learning have not been adequately researched in sub-Saharan Africa. This article describes the evidence of learning in WPBAs in a Family Medicine training programme in South Africa (SA).

Work-based learning shifts the focus from theoretical learning to learning in and from practice.[6] Work-based learning also broadens the scope of educational assessment from assessment *of learning* (AoL), summative components with pass/fail decisions,[5] to assessment *for learning (*AfL*).*[7] Assessments *for learning* form part of day-to-day clinical practice: seeking, reflecting, and responding to information from observation and dialogue to promote learning.[8] Assessment *for learning* provides meaningful narrative feedback to enhance the learning experience.[7,9] Assessments *of learning* are high-stakes assessments focusing on achieving learning outcomes at the end of a programme[7,10] for accountability, ranking, and certification of trainee's achievement of competence.[11]

The distinction between AfL and AoL is complex, making it difficult for trainers to discern how to use the different assessment types effectively.[11] Workplace-based assessments captured in learning portfolios (LPs) provide adequate evidence of trainees' competence and are collectively used for the summative AoL.[7] Given that WBL and WPBA are recent developments, it may be more difficult for trainers to use AfL and AoL to the trainees' best benefit.

Learning portfolios for workplace-based assessment

In programmatic assessment, defined as "a consciously designed assessment system in which the longitudinal development is visible to the learner as usable feedback which provides rich data for informed, holistic decision on making learner progression," individual data points from low-stake AfL accumulate into multiple data points for high-stake AoL.[4] Learning portfolios, introduced in the United Kingdom in 1996 for postgraduate general practice vocational training,[12,13] are now widely used as a longitudinal tool in programmatic assessments.

Learning portfolios offer several benefits for trainees' longitudinal development. Portfolios may include evidence of personal and professional WBL,[14] assessments of soft skills, like professionalism, communication, teamwork, and 'hard' clinical procedural skills.[4,15] Soft skills are better learned and assessed when opportunities are provided to address the complexities of clinical practice in the workplace.[4,14,15] Learning portfolios provide a systematic overview of the tasks, expected levels of competency for the required tasks, perceived levels of competence (ability to perform the tasks) and areas needing improvement.[15] Competency cannot be measured, but competence, an attribute of the person performing the task, can be measured.[16] Learning plans, an essential component of LPs, encourage trainees to track their educational progress and stimulate reflection and feedback as critical skills in self-directed learning.[13,17] Supervisors are expected to assist trainees in developing learning goals and support them in achieving their learning plans.[18,19] The most critical factor influencing LP use in high-income countries was supervision that stimulates trainees' reflection and promotes deep learning.[20,21] The organisation of portfolios also affects their efficacy.[21] Trainees require clear guidelines on the portfolio structure, format and content and how to avoid excessive paperwork.[21]

Workplace-based assessments are best used as part of a programmatic assessment approach; no single assessment method embodies all the required educational characteristics, such as reliability and validity, educational impact, and

acceptability.[22] However, different WPBA tools have varying educational impacts across clinical contexts.[23,24,25] In high-income countries, the effectiveness of WPBA tools relied on prior training on using the tools and the contexts where assessments were conducted.[22,24] One factor affecting WPBA is the lack of consensus on the number of assessments used as AfL.[24] Other factors arise from the trainee-tool interactions. For example, trainee-assessor relationships could promote lenient marking.[24] Despite the challenges associated with WPBAs, the trainees and trainers agree that WPBAs provide valuable narrative feedback and augment trainee self-reflective skills, thus improving learning opportunities.[26]

Potential barriers to effective LP use include the paperwork required, finding senior staff to supervise procedures, ineffective supervision, the lack of faculty engagement[21] and ticking boxes to indicate whether skills were performed.[17,27,28] Ticking boxes does not provide feedback on the quality of performance.[20] Other barriers that have been identified were the need for multiple assessors, inadequate supervisor and trainee training on WPBA tools, low trainee confidence, and whether WPBAs are conducted *for* learning or *of* learning.[13, 21,24] In one study, trainees were concerned that delayed feedback after WPBAs would impact their results – supervisors could not always remember individual trainees.[28]

While WBL theories and models have been developed, variations in how trainees and supervisors utilise WPBA tools across settings need further research.[13] Workplace-based assessment tools have been extensively investigated in high-income settings like the Netherlands and the UK, but there is a paucity of studies exploring their effect on trainee performance in low-middle-income contexts.[29] There is a need for further characterisation of LP use, purpose, structure, evidence for mentoring, and assessments across different contexts.[21] Some authors have suggested a need to explore the influence of context on LP use to understand why implementation failed in some contexts and to identify and interrogate improvements.[21]

The SA learning portfolio requirements

Learning portfolios were introduced in South Africa (SA) as a WPBA tool in postgraduate FM training in 2012.[30] The Colleges of Medicine of South Africa (CMSA), the examining board for the national exit examinations for registrars (SA postgraduate medical trainees), specifies five-unit standards and 83 programmatic learning outcomes to be achieved at the end of a four-year specialist training programme.[30,31,32] The national LP was designed to capture the evidence for 50 of the 83 learning outcomes.[31,33] The LP records evidence of registrars' personal and professional development through reflection and from WPBA tools.[30] Detailed learning plans should specify registrars' learning needs, plans to address their needs and the goals they have achieved.[34] Registrars have to obtain a subminimum of 60% in the LP for each of three years to progress to the following year and qualify for the national exit examinations.[30]

The guidelines for the national LP recommend establishing effective supervisor-registrar relationships with regular engagements, including monthly meetings, at least six hours of dedicated weekly training and supervision, and adequate mentoring.[30] Learning portfolios can be handwritten or electronic, depending on university requirements, but electronic portfolios are associated with better completion rates, improved quality of scoring entries, increased frequency of use, and sustained supervisor-registrar engagement.[35] Previous SA studies found that registrars' reflective skills, knowledge of the requirements, good supervisor feedback, and regular engagement with supervisors positively influenced LP use.[34] The skills list for registrars was revised and validated in a 2018 national Delphi study.[36] This list of 205 core and 39 elective skills is part of the national learning portfolio requirements.[30]

There are four self-reported competence levels for skills:

- A – Only possesses theoretical knowledge about the skill
- B – Possesses theoretical knowledge and observed that skill performed
- C – Performed the skill under supervision
- D – Can be fully entrusted to perform that specific skill independently

There are few studies on WPBA and using LPs in postgraduate medical training in low-middle countries, especially in public district health systems where WBL occurs across various PHC facilities and hospitals. This study adds to the discourse by

quantifying evidence of learning in LPs, evaluating the AfL and AoL, and investigating the influence of context, such as the training district or the year of training, on the nature of assessments.

Postgraduate family medicine programme at Wits University

Family medicine was recognised nationally as a new speciality in 2007. Wits University introduced a full-time postgraduate decentralised FM training programme in 2008. The training programme is structured across four years of training. Registrars undergo two- to three-week theoretical training blocks at the university annually, depending on the training year. The university also provides an online component comprising FM-related clinical and non-clinical topics, research, and journal clubs. Fourth-year registrars focus on the research component and undergo elective rotations to gain further knowledge in a clinical discipline or an area, depending on the registrar's interest gained during training years.

The FM registrar training programme is based in PHC clinics, community health centres (CHC), or district hospitals across the five study districts. Community health centres are 24-hour nurse-led facilities supported by general practitioners and family physicians (FPs). District hospitals are 50–300 bedded hospitals serving a defined population and providing 24-hour comprehensive care services and run by general practitioners with a few general specialists, including FPs.[37] Registrars rotate every two to three months in the district or regional-hospital departments for skills training. Skills rotations occur with registrars rotating through various departments, including internal medicine, obstetrics and gynaecology, and paediatrics. The timing, location, and duration of clinical rotations vary between districts. Decentralised clinical training also includes weekly training sessions at district regional training centres comprising academic discussions (clinical and non-clinical topics), clinical case discussions (one-on-one or group), and WPBAs using the mini-clinical evaluation exercise (mini-CEX) or direct observation of procedural skill tool. The structure of these sessions varied slightly across districts. Another training component is the monthly or bimonthly one-on-one engagements, captured in the LP, between registrars and supervisors to discuss registrars' learning needs,

review their learning plans and progress, and identify gaps to be addressed. In some districts, registrars also have observed consultations or procedures with FP supervision at CHCs or PHCs.

The Wits University FM registrar training uses the programmatic assessment model,[38] with multiple assessments during the training year. Assessments *for learning* include WPBAs across the CMSA-prescribed curriculum captured in the LP. Other LP sections are learning plans, educational meetings, direct observations, written assignments, logbooks, certificates for attending courses, meetings, and end-of-year assessments.[30] Assessment *for learning* is used to decide annual registrar progression: the quarterly assessments (QA) and the LP overall score are considered. The QA are observed consultations or procedures evaluated using WPBA tools by a supervisor from another district. The QA scores were taken as AfL separately from the overall LP scores contributing to the year mark. The involvement of multiple supervisors improves the validity of WPBA.[24] Assessment *of learning* includes university examinations conducted 18 months into the training programme and the national exit examination after at least three training years as the final high-stake assessment towards specialist qualification.

In the logbook section of the Wits University FM LP, registrars must achieve competencies clustered into core and elective skills within 14 clinical domains aligned to CMSA requirements. These clinical domains are adult health, ear, nose and throat (ENT), eyes and skin, women's health, emergency care, child health, consultation skills, clinical governance, orthopaedics, anaesthetics, forensics, community-oriented primary care (COPC), clinical administration, teaching and learning, and palliative care. Registrars must achieve competence at level D for all core skills and level C or D for elective skills. Their immediate supervisors evaluate registrars' bi-annual self-assessments of skills in their logbooks before submitting the LPs to the university for final evaluation by the portfolio committee.

Methods

Study design

This study forms part of a broader, mixed-methods case study evaluating the postgraduate FM training programme at Wits University using a logic model. The quantitative component of the broader study reported in this article evaluated evidence of learning in WPBAs as short-term outcomes of the logic model—the short-term outcomes were proxy measures of registrars' knowledge and skills.

Study setting

The study was conducted across the five training districts affiliated with Wits University: Ekurhuleni, Johannesburg Metro, Sedibeng, and West Rand in the Gauteng province, and Dr Kenneth Kaunda in the North West province of South Africa. Gauteng province is more densely populated (total population above 15 million) than the North West province (just over 4 million).[39] However, more than 75% of the population in both provinces is uninsured and utilises government health services at PHC clinics, CHCs and district hospitals.[39] There is a gross disparity in the distribution of doctors across the provinces. While Gauteng province has over 4000 medical practitioners and 1500 specialists, North West has an acute doctor shortage with just above 1000 medical practitioners and 100 specialists covering the province.[39]

The health facilities that serve the population vary widely across the training districts.[39,40] While the Johannesburg Metro district has 108 PHC clinics, 11 CHCs, and two district hospitals, Ekurhuleni has 84 PHC clinics, nine CHCs, and one district hospital. Sedibeng has eight CHCs and 30 PHC clinics, while West Rand district has 45 PHC clinics and three CHCs.[41] The less-populated Dr Kenneth Kaunda district in the North West province has only 30 PHC clinics and 10 CHCs, spread over 14671 kilometres.[41] The number of regional and tertiary hospitals ranges from five hospitals in the Johannesburg Metro district to no tertiary facility in the Sedibeng, West Rand and Dr Kenneth Kaunda districts.[41] Most of the uninsured population in these communities relies solely on health services provided by PHC

and CHC facilities as the first point of health care, emphasising the need for high-quality patient care to be provided at these facilities.

Study population and sampling

The study population included all 18 registrars' LPs across three years of the 2020 training programme. All 18 registrars who submitted LPs at the end of the training year 2020 (*N*=18) consented to their LPs being evaluated. The registrars' total QA and LP sectional scores, including their skills competence levels and final LP scores, were collected as the AfL. The AoL component for the first- and second-year registrars was the outcome of the 18-month university examinations and the national exit college examination results for third-year registrars.

Data collection

The 'evidence for learning tool' was developed to record registrars' scores and skills competence levels. Quarterly assessment scores and university or CMSA examinations' pass or fail outcomes (in the same or the following year) were extracted from university records. Registrars in the second year wrote the Wits University exams in 2020; the first years wrote in 2021 after completing their 18 months of training. The third-year registrars, who had submitted their LPs in 2020, sat the CMSA exams in 2021, in their fourth year of study. This study used supervisors' total scores allocated for QA, LP, and various LP sections and the final pass/fail in the university or CMSA examinations as proxy measures of registrars' knowledge.

The nationally validated skills set[36] was used to develop the skills section of the data collection tool. Registrars' self-assessment scores for each skill in the LP logbook were taken as proxy measures for skill competencies. After the final submission, the registrar's immediate supervisor and the university's portfolio committee verified all the LP scores.

Data analysis

The data were entered into an MS Excel spreadsheet and imported into Stata 14.2 software. Median and interquartile ranges were calculated for the total LP, LP sectional, and QA scores for each training district and year. Frequencies of self-reported competence levels for each skill (category scores A-D) were determined. Registrars' total skill-set scores for each domain were calculated using the highest competency level 'D'; competence levels A, B, and C were not considered. For example, if a registrar assessed themselves at level D in 30 of the 38 'adult health skills', their total skills set score for that domain would be 30/38. The median and interquartile ranges for each domain's total skill set score were calculated for each training year and district.

Ethical considerations

Ethical approval was obtained from the Wits University's Human Research Ethics Committee (Medical) (certificate number M191140). The University Registrar and the Head of the Department of Family Medicine granted permission to conduct the research and access the university records and LPs. Voluntary informed written consent was sought from each registrar to access the LPs.

Results

Six LPs from each year of registrar training were assessed (N=18). The total LP median scores and interquartile ranges were 76.3 (62.1-81.2), and the median and interquartile ranges for the QA scores were 64.9 (60.7- 69.5).

The median and interquartile ranges calculated for the total LP scores and various LP sectional and QA scores across the training years (Y1-Y3) are shown in Table 1. The total LP median scores were higher in Year 3 compared to Year 1 and Year 2 (Table 1). The Year 2 registrar's QA median scores were higher than Years 1 and 3 (Table 1). Supervisors awarded full marks (10/10) in some LP sections in Y1 and Y2 but not in Y3 (Table 1).

Table 1: Assessment for learning scores in Learning Portfolios and Quarterly assessments across training years

	Total scores	**Assessment Scores**		
Type of assessments		Year 1(Y1)	Year 2(Y2)	Year 3(Y3)
		[median (IQR)]	[median (IQR)]	[median (IQR)]
		n = 6	n= 6	n= 6
Learning Portfolio sections				
Learning Plan (a)	10	7.8 (7.0-8.3)	9.2(8.0-10.0)	8.2(7.5-8.7)
Supervisor report on clinical allocations (b)	10	7.9(7.5-8.3)	8.1(7.6-8.3)	8.1(7.7-8.7)
Educational meetings (c)	20	18.7(15.8-20.0)	17.5(10.0-20.0)	17.7(17.2-20.0)
Observations of the registrar (d)	10	10.0(8.0-10.0)	10.0(10.0-10.0)	8.4(7.7-8.7)
Written assignments (e)	10	6.4(6.0-6.6)	7.0(6.8-7.2)	6.5(5.8-6.7)
Logbook (f)	30	0 (0-20.0)	20.8(14.0-30.0)	23.7(21.5-27.0)
Global Rating (g)	10	7.0(6.0-8.0)	6.0(6.0-6.0)	7.0(6.0-7.0)
Learning Portfolio total scores (Total of rows a-g)	100	59.9(53.9- 81.1)	73.0(64-87)	81.0(75.6-81.2)
Quarterly Assessment	100	61.4 (55.7-67.1)	67.3(62.6-73.2)	64.8(62- 67.5)

Table 2 shows the median and interquartile ranges calculated for the total LP scores and various LP sectional and QA scores across the five districts (D1-D5). The total LP median scores varied considerably across D1-D5 (Table 2), but not the QA median scores. Again, some LP sections (learning plans, educational meetings, and observations) had median scores of 10/10 in some districts (Table 2).

In the first- and second-year summative assessments (AoL), six out of 12 registrars passed the 18-month university examinations on the first attempt; five of the 12 failed them, and one registrar did not take the mid-point examinations. Of the six registrars who completed the three years of training, four who sat the national exit examination passed on their first attempt, and two did not take the examination.

Table 2: Assessment for learning scores in Learning Portfolios and Quarterly Assessments across training districts (N=18)

Type of assessments	Total scores	Assessment scores				
		District 1 (n=5), median (IQR)	District 2 (n=3), median (IQR)	District 3 (n=3), median (IQR)	District 4 (n=4). median (IQR)	District 5 (n=3), median (IQR)
Learning Portfolio sections						
Learning Plan (a)	10	8.0 (7.5-8.0)	7.0(7.0-10.0)	10.0(10.0-10.0)	8.5(8.2-9.4)	8.0(7.0-8.3)
Supervisor report on clinical allocations (b)	10	8.1(7.5-8.2)	8.3(7.5-9.1)	8.0(7.6-8)	8.0(7.7-8.3)	8.5(7.0-8.7)
Educational meetings (c)	20	17.5(17.3-17.5)	16.0(15.8-20.0)	17.0(8.0-17.2)	19.0(14.0-20.0)	20(0.0-20.0)
Observations of the registrar (d)	10	10.0(10.0-10.0)	9.1(8.0-10.0)	10.0(8.3-10.0)	9.3(8.1-10.0)	8.0(7.0-8.7)
Written assignments (e)	10	6.7(6.6-6.8)	6.6(5.8-6.8)	6.3(6.3-7.1)	6.5(5.8-7.1)	6.8(5.5-7.2)
Logbook (f)	30	2.5(0.0-22.0)	27.0(0.0-29.0)	14.0(8.0-20.0)	27.7(23.7-30.0)	21.5(0.0-21.5)
Global Rating (g)	10	7.0(6.0-8.0)	7.0(6.0-7.0)	6.0(6.0-6.0)	6.5(6.0-7.0)	7.0(4.0-8.0)
Learning Portfolio total scores (Total of items a-g)	100	62.1(58.8-75.6)	81.0(53.9-88.1)	64.0(63.8- 69.0)	83.5(81.2-88.89)	77(31.5-81.0)
Quarterly Assessment	100	67.1(66.0-73.2)	67.5(55.7-72.9)	62.6(60.0-63.8)	65.4(62.2-68.3)	62.0(54.8-70.8)

Clinical skills competence levels

The logbook skills section was incomplete across all training years, but primarily in the first year: four first-year registrars did not complete the section. The self-assessed competence levels of 18 registrars for 205 core clinical skills and 39 elective skills varied considerably (Appendix 1). Depending on the registrars' self-assessment and the type of skill, competence levels of skills varied and scored from A to D (Appendix 1). Third-year registrars self-assessed their competence as higher (D scores) in most skills than in the other two years. The registrars reported higher competence levels in clinical domains such as adult health, women's health, child health, and emergency care than ENT, eyes and skin, orthopaedics, and anaesthetics. First and second-year registrars scored low in domains like orthopaedics, anaesthetics, ENT, eyes and skin because these clinical rotations occur during their third year of training. Most registrars, even first-year registrars, reported higher competence levels in consultation, clinical administration, clinical governance, COPC, and teaching and learning domains (Appendix 1).

Although the self-reported level of competence in performing clinical skills was relatively better among third-year registrars compared to years one and two, some core skills still included levels A, B and C. Examples included a laparotomy for ectopic pregnancy, cricothyroidotomy, assisted vaginal delivery, proctoscopy, vasectomy, and reduction of elbow dislocation (Table 3). The total number of registrars in each year was six but varied as registrars did not report on many core skills and left them incomplete (Table 3).

Table 3: Self-reported competence levels on selected core clinical skills among third-year registrars (n=6)

Skills	A: Only theoretical knowledge	B: Observed the skill	C: Performed under supervision	D: Fully entrusted to perform independently	Not reported
Cricothyroidotomy	0	1	3	1	2
Laparotomy for ectopic pregnancy	0	1	3	1	2
Assisted vaginal delivery	0	2	2	1	1
Elbow dislocation	0	1	2	2	1
Incision and drainage perianal abscess	0	0	3	2	1
Perform cardiac pacing	0	1	0	3	2
Apply club foot cast	0	2	1	1	2
Proctoscopy	1	0	3	1	1
Spirometry	0	2	1	2	1
Vasectomy	1	3	1	0	1
Culdocentesis	0	3	0	1	2
Brachial block	1	1	2	1	1

Table 4 shows the total skills set score medians and interquartile ranges for all 14 clinical domains in the LP across the three years of training. These medians were higher in adult health, women's health, emergency care and child health for second- and third-year registrars than ENT, eyes and skin, orthopaedics, and anaesthetics domains (Table 4). The year two median was higher than year three for the COPC and teaching and learning domains. When total core skills median scores progressed across the training years, elective skills median scores remained low across all three training years (Table 4).

Table 4: Total skills set score median and interquartile ranges for years 1-3 (N=18) in 14 family medicine domains

Domain	1* (n=6) median; IQR	2 (n=6) median; IQR	3 (n=6) median; IQR
Adult health (n=38)	0 (0-21)	20 (10-23)	23 (14-28)
ENT, eye and skin (n=22)	0 (0-10)	5 (1-7)	12 (7-18)
Women's health (n=30)	0 (0-21)	12.5 (8-18)	20 (3-23)
Consultation (n=14)	0 (0-14)	10.5 (6-12)	13 (8-14)
Emergency care (n=32)	0 (0-28)	27 (19-32)	28 (16-29)
Orthopaedics (n=14)	0 (0-7)	1 (0-9)	8 (2-9)
Anaesthetics (n=16)	0 (0-8)	0.5 (0-5)	13 (12-14)
Child Health (n=12)	0 (0-2)	10 (9-10)	11 (10-12)
Clinical administration (n=6)	0 (0-0)	5.5 (5-6)	5.5 (5-6)
Forensics (n=4)	0 (0-3)	2 (2-4)	3.5 (3-4)
Palliative care (n=3)	0 (0-0)	0 (0-0)	1 (0-2)
Clinical governance (n=8)	0 (0-2)	3.5 (1-6)	4 (0-8
COPC (n=3)	0 (0-3)	2.5 (0-3)	1 (0-2)
Teaching and learning (n=9)	0 (0-4)	3.5 (2-5)	3 (0-5)
Core skills total (N=205)	0 (0-138)	104 (81-115)	145.5 (105-172)
Elective skills (N=39)	0 (0-2)	2 (0-6)	13.5 (8-22)

*4/6 year 1 registrars did not complete the logbook, scoring zero as lower quartile in all total skills set score medians. The total skills set score is the number of self-assessed D-scores in each domain.

Discussion

This study examined the evidence of registrar learning from scores and self-reported clinical-skills competence levels recorded in LPs and QAs. The major finding was that LPs are not being used optimally as self-directed learning tools in decentralised training contexts, as has been found previously.[13,17,42] The scores in various LP sections and skills level scores (for each skill and skill set) were variable in different clinical domains across training years and lacked adequate evidence of registrar progression in knowledge and skills. Although the LPs showed evidence of registrar learning, they can be used more effectively in WPBA.

Multiple assessments from various sources in authentic contexts improve assessment validity and reliability.[22] Although there was evidence that the programme included multiple WPBAs, there was also evidence of lenient scoring in LP sections like the learning plans and skills competence levels. The negative

impact of lenient scoring may be exacerbated by inadequate narrative feedback, as previously reported for this training programme.[35] These combined problems raise concerns about whether LPs are being used effectively to support self-directed learning and suggest that supervisors need more clarity on using LPs in postgraduate training.[13,17]

The total LP scores improved across training years, but in QA scores across three years, second-year registrars had a higher score average than third-year registrars, similar to previous studies that detailed the inadequacies and leniency of supervisors while scoring WPBAs.[43] Other LP sections, such as educational meetings and direct observations, showed the required number of educational meetings and WPBAs between supervisors and registrars. As stated in previous studies,[28,34,42] registrars and supervisors in this study focused on completing LP sections rather than effectively utilising them as a learning tool. Whether supervisor-registrar engagement was quantified or engagement took place according to the expected standards with quality feedback to the registrars needs further exploration. In our WBL context, all LP scores were allocated by immediate FP supervisors and later verified by the university's portfolio committee. The LP introduction in the first year, with adequate registrar training on its use and ongoing mentoring by supervisors, could have enhanced LP utilisation during self-directed learning.[21,44]

Quarterly assessment scores, part of the AfL component, contributed separately from LP scores to decide yearly registrar progression. In authentic clinical settings, supervisors and registrars struggle to use WPBA tools such as mini-CEX strictly as a summative tool during QA, always adding a formative component to those assessments. Similar challenges were identified related to mini-CEX use in high-income countries.[24,43]

The self-assessed competence in this study ranged across all four levels. Self-assessment is a feasible method for registrars to report their perceived competence, but it is susceptible to over- or under-reporting.[45,46] Although the logbooks ensure that trainees perform the maximum number of skills required for competence,[23] incomplete entries across all three training years undermine that

intention. Registrars' may have been reluctant to complete the logbook skills section because they perceived their skills competence as inadequate. Alternatively, they may not have felt confident about reporting their competence levels because of inadequate exposure to these skills in their context. Despite the increasing emphasis on self-assessment and critical analysis of trainees' performance in competency-based medical education,[47] the registrars appeared to lack the skills to self-assess their performance. The reported competence levels improved in higher training years, suggesting continuous skills learning at their workplaces. Registrars perform skill rotations in major disciplines during their first and second years of training, allowing them to acquire all needed skills. It was encouraging to find that registrars reported adequate competence levels in domain-specific skills learnt earlier in their training, such as consultation, clinical governance and administration, community-oriented primary care, and teaching and learning.

A concerning finding was that specific skills such as cricothyroidotomy, assisted vaginal delivery, laparotomy for ruptured ectopic pregnancy and reducing an elbow dislocation were some examples of skills in which third-year registrars reported lower skills competence levels. Third-year registrars should be fully entrusted to perform these essential skills and be able to train junior registrars or students. Registrars' skills deficiencies should be included in learning plans as learning needs, discussed with supervisors, and planned on how to acquire them. Achieving adequate procedural skill competence levels by registrars is a priority in full-time postgraduate FM training programmes compared to older part-time programmes.[44] The medical officers working in district hospitals in similar contexts reported adequate competence in performing these procedures.[45] Once qualified as an FP, the registrar will need to function as a consultant and capacitator for medical practitioners and other health workers by performing various surgical and obstetric skills to strengthen district hospital services.[48] This study reiterated that registrars require adequate exposure to learning opportunities to achieve mastery in performing core procedures encountered commonly in primary-care settings.

Third-year registrars reported lower competence levels on core clinical skills such as proctoscopy, applying clubfoot cast, vasectomy, culdocentesis, and performing

a brachial block. Questions that need to be answered include whether registrars had sufficient opportunities or allocated time to practise these skills during clinical rotations and whether these procedures were performed in sufficient numbers in various disciplines of the regional and district hospitals where registrars rotated. Current trends in medical education emphasise contextualising the curriculum and learning opportunities to acquire knowledge and skills needed in the health care system where trainees practice.[49] While the FM skills list was revised in 2017,[36] some core skills are still not performed sufficiently at peri-urban district hospitals.[45,50] Perhaps it is time to revise the FM registrar training skills list to include more relevant context-specific procedural skills.

The impact of the training context on achieving the required levels of core skills competence may not be sufficiently considered. Family physicians in SA work in various health-system contexts like district, regional, and tertiary hospitals, private general practice, or rural and urban clinics, where they require most of these skills.[51] Mastering all core skills could be more relevant for an FP practising in a rural district hospital where acute health worker shortages and referral challenges are experienced than in urban settings. It may be time to consider separating skill sets for FPs practising in rural and urban contexts.[45,52] Even in high-income countries, doctors working in rural areas reported higher skill levels than their urban counterparts.[46,53] A compulsory rural block for registrars working in peri-urban district hospitals to achieve specific skills, e.g., a two to three-month rotation or even a year of longitudinal clinical work from a peri-urban district hospital to a rural district hospital, could potentially mitigate the skills gaps identified among registrars.

Although studies were conducted when the LP was introduced into postgraduate FM training in SA about ten years ago,[42] there has not been further research to measure its longitudinal impact. This study initially sought evidence for WBL in the short-term, but comparing the findings to studies from a decade ago highlights the long-term impact after LPs were introduced whether they were effectively utilised in WBL. Despite the positive impact of LPs on WBL, this study highlighted several issues that adversely affected how effectively registrars' used the LPs, including incomplete logbook sections and a lack of clarity about the roles of FPs.

Workplace-based assessments captured in the LP provide trainees with more opportunities to reflect on their practice in authentic settings, positively influencing learning behaviour.[43] Teamwork, professionalism and self-appraisal are all assessed when a mini-CEX tool is used in WPBAs.[22] The assessment of complex tasks relied on the trainee's ability to integrate cognitive, psychomotor, and affective components, best evaluated in authentic clinical settings.[22] Currently, the LP primarily focuses on scoring systems to determine whether the numbers needed are met or whether registrars achieved adequate skill competence levels. Providing more qualitative feedback on registrar performance will enhance the comprehensiveness of WPBAs. Most importantly, creating a learning environment that encourages a reflective dialogue between trainees and their supervisors is vital for effective LP utilisation.[20]

Limitations

The number of LPs assessed was low despite including all those available. However, the results contributed to a better understanding of the 'phenomenon of interest' for the broader mixed-methods case study, namely, the postgraduate FM registrar decentralised training at Wits University.

The data extracted depended on the legibility and completeness of various LP sections. Many skill competencies were incomplete, especially in the first-year registrar portfolios, with data collection likely impacted by the COVID-19 lockdown. During the lockdown, registrars struggled to complete LPs in some clinical skills rotations, which affected our results.

Self-assessment may have resulted in the over- or under-reporting of skills competency levels. However, this effect may have been mitigated by supervisors' evaluating competency levels by directly observing procedures. Additional mitigation likely arose during the University's portfolio committee's final evaluation. All districts are represented on this internal committee, which interrogates the LPs and discusses inconsistencies, thereby improving the validity of the results. The initial intention was to determine the association of the scores and skills with the

training districts and training years, but this was not feasible given the small number of LPs. Future research on entrusted decisions by supervisors on observed skills may corroborate registrars' self-reported competency levels.

Recommendations

The study highlighted the need for faculty development and registrar training to improve family physicians' and registrars' literacy in workplace-based assessments. Training will capacitate supervisors to mentor registrars effectively and enhance registrars' self-directed learning. The learning portfolios should include multiple assessments of various competencies, with both hard and soft skills, from various assessors in different contexts. Adequate formative feedback needs to be provided to augment registrar learning opportunities. Regular formative assessment visits by faculty programme managers will improve and maintain workplace-based assessment standards, which could translate to better registrar learning at their workplaces.

Conclusion

This study aimed to evaluate evidence of learning in learning portfolios, formative and summative WPBAs, and the influence of the training district and the year of training on assessments. While the findings provided a holistic view of WPBA in family medicine training in one setting, they could apply to similar contexts at South African universities. Future research on WPBA across multiple training programmes will give a complete picture of postgraduate family medicine training in South Africa, which may also benefit other sub-Saharan African countries.

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Competing interests

The authors declare they have no competing interests.

Authors' contributions

NJE conceptualised the research, collected and analysed the data and wrote the first draft of the manuscript. AZG and LJ contributed to the data analysis and writing the subsequent drafts. All authors contributed to the manuscript and approved the final version.

Ethical considerations

Ethical approval was obtained from the Human Research Ethics Committee (HREC Medical) of the University of the Witwatersrand (Certificate number M191140). Permission was obtained from the university Registrar and the Head of the Department of Family Medicine. Informed consent was obtained from registrars to access the learning portfolios. The research was carried out following the Helsinki Declaration.

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Data availability

Data is available from the corresponding author upon reasonable request.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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Appendix 1: Self-reported skills competence levels on 205 core clinical skills in 18 registrar learning portfolios

	Skills (N=18)	**Category A A=only theoretical knowledge theory (n)**	**Category B** B=Observed the skill (n)	**Category C** C=Performed under supervision (n)	**Category D** D=Fully entrusted to perform independently (n)	**Not reported/ left blank**
Adult Health						
Perform Side room tests	Use a glucometer	0	0	0	11	7
	Use a haemoglobinometer	0	0	1	11	7
	Perform a pregnancy test	0	0	0	12	6
	Perform urinalysis	0	0	0	12	6
	Venepuncture	0	0	0	11	7
Adult health general	Femoral vein puncture	0	0	0	11	7
	Lumbar puncture	0	0	0	11	7
	Routine intravenous access	0	0	0	11	7
	Lymph node excision biopsy	1	0	3	7	7
	Perform point-of - care testing	0	0	1	11	7
Adult musculoskeletal	Measure shortening of the legs	0	0	2	9	7
	Aspirate and inject the knee joint	0	1	2	5	10
	Inject tennis elbow or golfer's elbow	0	3	1	5	9
	Interpret radiographs of joints and bones	0	1	1	9	7
	Inject carpal tunnel syndrome	0	4	2	2	10
	Inject De Quervain's tenosynovitis	0	4	1	3	10
	Inject the shoulder and subacromial bursa	1	2	2	3	10
	Inject trochanteric bursitis	1	4	1	2	10
Adult abdomen	Incision and drainage of perianal haematoma	0	1	4	5	8
	Interpret the abdominal radiograph	0	0	0	13	5
	Proctoscopy	1	2	4	2	9
	Interpret barium swallows	0	2	3	4	10
Adult chest	Electrocardiogram set up. record and interpret	0	0	0	13	5
	Interpret chest radiograph	0	0	0	13	5
	Measure peak expiratory flow	0	2	0	11	5
	Nebulise a patient	0	0	0	13	5
	Pleural tap	0	0	2	9	7

	Use inhalers and spacers	0	0	1	12	5
	Perform and interpret exercise stress test	0	5	0	4	9
	Perform and interpret office spirometry	0	4	2	3	9
Adult Urology	Penile block	0	0	2	8	8
	Reduce a paraphimosis	0	1	1	9	7
	Male medical circumcision	0	3	3	5	8
	Drain hydrocele	0	3	2	4	9
	Insert a urinary catheter	0	0	0	11	7
	Insert a suprapubic catheter	0	0	3	9	6
	Interpret intravenous pyelogram	1	2	1	3	11
	Vasectomy	2	4	2	1	9
ENT, Eyes, Skin						
Eyes	Excision of chalazion	2	2	1	1	12
	Use a Schiotz tonometer	3	1	0	3	11
	Fundoscopy	0	1	1	7	9
	Instil drops or apply ointment	0	0	0	10	8
	Remove foreign body from the eye	0	1	2	5	10
	Test for squint	0	1	2	4	11
	Washout of eyes	0	0	1	7	10
ENT	Assess hearing loss	0	0	2	7	9
	Reduce a fractured nose	2	2	1	3	10
	Remove a foreign body from ear and nose	0	0	1	10	11
	Syringe. dry swab an ear	0	0	0	10	8
	Take a throat swab	0	0	0	11	7
	Manage epistaxis	0	0	1	1	16
	Suture a pinna lobe	0	0	1	9	8
	Drain a peritonsillar abscess	0	4	2	3	9
Skin	Inject keloids	0	1	3	3	12
	Phenol ablation of ingrown toenail	2	1	2	1	12
	Excise sebaceous cyst	0	1	2	2	12
	Compression dressing to venous leg ulcer	0	0	3	7	8
	Cryotherapy or cauterisation	1	1	0	5	12
	Skin biopsy	0	1	3	3	12
	Wide-needle aspiration biopsy lymph node	1	0	1	6	10

Women's health						
Pregnancy	Obstetric ultrasound	0	0	1	9	8
	Interpret antenatal growth chart	0	0	0	11	7
	Assess foetal well-being during labour	0	0	0	11	7
	Episiotomy and suturing	0	0	2	9	7
	Examine progress during labour and use partogram	0	0	1	10	7
	Normal vaginal delivery	0	0	1	10	7
	Apply and interpret the cardiotocograph	0	0	2	9	7
	Assess foetal movement and counsel use of kick chart	0	0	0	10	8
	Assisted vaginal delivery	0	3	2	5	8
	Caesarean section and management of bleeding	0	1	3	8	6
	Evacuation of uterus	0	0	0	9	9
	Manual removal of placenta	0	0	1	9	8
	Repair of third-degree tear	0	2	3	5	8
	Pelvic ultrasound	0	0	2	9	7
Woman's health	Culdocentesis	1	4	0	2	11
	Hormone implants	0	2	3	7	6
	Laparotomy for ectopic pregnancy	0	3	4	3	8
	Termination of pregnancy	0	2	2	7	7
	Insertion of intrauterine contraceptive device	0	2	3	7	6
	Papanicolaou smears	0	0	0	14	4
	Dilatation and curettage	0	0	1	9	8
	Drainage Bartholin's abscess or cyst	1	0	2	9	6
	Endometrial biopsy	0	2	1	8	8
	Fine-needle aspiration biopsy of breast lump	1	1	1	7	8
	Tubal ligation	0	0	2	8	8
	Cervical polyp removal	0	3	3	2	10
Newborn	Assess gestational age at birth	0	0	0	12	6
	Counsel on Kangaroo mother care	0	0	0	11	7
	Resuscitate a newborn	0	1	0	12	5
	Umbilical vein catheterisation	0	0	0	13	5
Consultation	Patient-centred consultation	0	0	1	13	4

	Use genogram and eco-map	0	0	0	14	4
	Develop and use flowcharts for chronic care	0	2	1	8	7
	Motivate behaviour change	0	0	2	12	4
	Assess and consult families. couples	0	0	1	12	5
	Shared consultation to capacitate nurse practitioner	0	0	1	13	4
	Counselling skills for HIV. Termination of pregnancy, sexual assault	0	0	2	12	4
	Break bad news	0	0	1	12	5
	Mini–Mental State Examination	0	0	1	10	7
	Use problem-orientated medical record	0	0	1	10	7
	Conduct a family conference	0	1	3	8	6
	Cope with language barriers	0	0	2	11	5
	Holistic assessment and management	0	0	1	12	5
	Sexual history and counselling	0	0	2	9	7
Emergency care						
	Calculate % burn	0	1	12	0	5
	Manage choking	0	0	3	7	8
	Prescribe oxygen using a variety of devices	0	0	0	13	5
	Immobilise the spine	0	0	0	11	7
	Insert an advanced airway Endotracheal tube, laryngeal tube	0	0	0	13	5
	Measure the Glasgow Coma Scale	0	0	1	12	7
	Administer rabies prophylaxis	0	0	0	12	7
	Advanced cardiopulmonary resuscitation – Adult	0	0	0	13	5
	Advanced cardiopulmonary resuscitation– Child	0	0	1	8	9
	Debride wounds or burns	0	0	1	12	5
	Gastric lavage	0	0	1	9	8
	Give a blood transfusion	0	0	0	13	5
	Incision and drainage of abscesses	0	1	0	12	5
	Insert chest drain	0	0	0	13	5

	Insert nasogastric tube	0	0	0	13	5
	Interpret radiographs in trauma	0	0	1	11	6
	Emergency venous access	1	0	2	9	7
	Manage snake bite	1	2	2	6	**8**
	Primary survey	0	0	0	13	5
	Relieve tension pneumothorax	0	0	1	10	7
	Remove a foreign body from skin	0	0	2	8	8
	Secondary survey	0	0	0	13	5
	Selecting emergency equipment for doctor's bag	0	0	1	12	5
	Debride and suture lacerations	0	0	0	13	5
	Prepare and stabilise a critically ill patient for transport	0	0	2	11	5
	Cricothyroidotomy	1	2	3	4	8
	Insert central line	0	1	2	6	10
	Connect a patient to a ventilator and monitor the patient	0	2	0	10	6
	Perform cardiac pacing	0	2	2	7	7
	Perform synchronised cardioversion	0	1	1	9	7
	Perform arterial sampling: adult and child	0	0	1	11	8
	Classify patient according to triage system	0	0	0	10	8
Orthopaedics						
	Apply finger and hand splints	0	1	2	8	7
	Apply casts to upper and lower limb	0	0	2	8	8
	Closed reductions on hand. forearm. tibia. fibula	0	1	2	8	7
	Set up skeletal and skin traction	1	0	1	8	8
	Reduce elbow dislocation	0	1	3	6	8
	Reduce hip dislocation	0	2	3	5	8
	Reduce radial head dislocation	0	2	2	5	9
	Reduce shoulder dislocation	0	0	0	11	7
	Excise ganglion	1	0	3	5	9
	Amputations – fingers	1	1	2	3	12
	Apply club foot cast	1	3	1	2	11
	Debridement of open fractures	0	1	1	6	10
	Emergency fasciotomy	1	2	1	1	12
Anaesthetics						

	Injections – intra-dermal. subcutaneous. Intramuscular	1	0	0	8	11
	Ring block	1	0	0	10	7
	Check Boyle's machine	1	0	0	7	10
	Control airways with mask	1	0	0	10	8
	General anaesthetic	1	0	0	6	11
	Intubate and ventilate patient	0	0	0	11	7
	Ketamine anaesthesia	1	0	0	8	9
	Monitor patient during anaesthetic	1	0	1	6	9
	Monitor patient during recovery	1	0	0	6	11
	Reverse muscle relaxation	1	0	1	5	11
	Select an appropriate circuit – Magill Circle. T-piece	1	1	0	6	10
	Spinal anaesthetic	1	0	0	6	11
	Ventilate patient using mask and bag	0	0	1	6	11
	Bier's block	1	3	2	1	11
	Brachial block	2	1	3	1	11
	Administer conscious sedation and monitor	0	1	0	8	9
Child Health						
	Assess growth and classify malnutrition	0	0	0	11	7
	Capillary blood sampling	0	0	0	10	8
	Assess chest radiograph in child	0	0	0	12	6
	Developmental assessment	0	0	1	10	7
	How to do. interpret Tine and Mantoux tests	0	0	0	12	6
	Intraosseous line	0	0	1	9	8
	Intravenous access in a child	0	0	0	12	6
	Lumbar puncture in a child	0	0	1	11	6
	Manage problems using the integrated management of childhood	0	0	0	11	7
	Suprapubic bladder puncture	0	1	3	5	9
	Venepuncture – upper limb and external jugular vein	0	0	1	9	8
	Manage neonatal jaundice with phototherapy	0	0	2	8	8
Clinical administration						

	Complete sick certificates	0	0	0	12	6
	Complete death certificates	0	0	0	12	6
	Certify patient under Mental Health Care Act	0	0	1	8	9
	Writing appropriate referral letters	0	0	0	12	6
	Managing a clinic for chronic care	0	0	0	12	6
	Perform work assessment and complete disability grant	0	0	1	11	6
Forensics						
	Assess. manage and document drunken driving	0	0	0	12	6
	Assess. manage and document interpersonal violence	0	0	2	10	6
	Assess. manage and document sexual assault	0	0	2	7	9
	Complete J-88 form following assault	0	0	0	13	5
Palliative care						
	Counselling of a dying patient	0	0	3	4	11
	Hypodermoclysis (subcutaneous infusion)	2	1	2	2	11
	Set up a syringe driver	0	0	2	5	11
Clinical governance						
	Contribute to the development or revision of guidelines	0	0	3	5	10
	Facilitate the implementation of clinical guidelines	0	0	1	8	9
	Improve quality of care by facilitating QIP	0	0	4	8	6
	Improve cost-effectiveness by rational prescribing	0	0	1	8	9
	Build capability and quality care by teaching. training. and mentoring	0	0	3	9	6
	Critically appraise new evidence	0	0	1	8	9
	Appraise the competence of new clinicians and set appropriate levels of independence versus support	0	0	2	6	10
	Evaluate the quality of care in relation to the relevant clinically	0	0	4	4	10

	orientated national core standards					
COPC						
	Do a home visit	0	0	2	8	8
	Make a community diagnosis	0	0	2	8	8
	Promote health in communities	0	0	1	8	9
Teaching and training	Plan and implement a teaching or continuing professional development activity	0	0	1	9	8
	Use a portfolio of learning	0	0	1	8	9
	Mentor a colleague	0	0	2	7	9
	Facilitate small group learning	0	0	1	10	7
	Prepare and give a presentation	0	0	1	11	6

CHAPTER 9: DISCUSSION AND CONCLUSIONS

9.1. INTRODUCTION

This chapter describes how the results from the quantitative and qualitative components of this mixed methods evaluation study reported in the four published articles and one under review (see Chapters 4-8) were integrated to answer the overarching research question guiding the study: *What were the nature and extent of the supervision and learning practices in the FM training programme at Wits University during 2020?*

Integrating qualitative and quantitative findings is the cornerstone of MMR.[1,2] The value of MMR could easily be missed when quantitative and qualitative results are reported separately.[1] Integrating results creates a synergistic evaluation where one enables or contradicts the other finding, facilitating a complete understanding[3] of the phenomenon evaluated. Synthesising meta-inferences, which are conclusions generated by integrating results from qualitative and quantitative study components, adds to the quality of inferences.[3,4]

The MMR literature describes various integration strategies:

- Data transformation or conversion transforms one data type into another, i.e., quantitative to qualitative (qualitizing) or qualitative to quantitative (quantising).[4,5]
- Data consolidation combines data types to create new consolidated variables.[5,6]
- Data comparison compares data from different sources and integrates the data into a coherent whole.[5]

Given the more prominent qualitative component of this study, the following steps were taken to integrate the data (Appendix U):

1. The quantitative results were **converted** into qualitative data.
2. The study findings were **consolidated** by adding the qualitised data to the qualitative findings in a joint display.

3. Where possible, the qualitised data was fitted into one of the existing subthemes, or new subthemes were created.

The consolidated dataset was **compared**, and new subthemes and themes were synthesised, as shown in Table 9.1.

Table 9.1: Synthesised subthemes and themes

Subthemes	Themes
Family physician shortages exist at the training sites.	More material and non-material resources are needed across the training sites.
Deficiencies in infrastructure, equipment, and funding exist across the training sites.	
The availability of resources was inequitable across the training sites.	Resources, supervision, and learning opportunities must be standardised across the training sites.
Supervision varied within and across the training sites.	
The quality and extent of learning opportunities were context-dependent.	
Registrars had difficulty achieving a work-life balance.	A supportive learning environment is essential to address the challenges faced by registrars and supervisors.
Training across different facilities enhances learning.	
Family physicians' multiple roles and responsibilities impact the time available for supervision.	
The family medicine training programme needs better recognition.	Sufficient key-stakeholder support is critical for the success of the programme.
Supervisors need basic and ongoing training and development.	
District management must provide better support for registrar training activities.	
Supervisors have different levels of clinical knowledge and skills.	Exemplary supervisor attributes influence learning.
Supervisors' characteristics influence how they supervise registrars.	
Supervisory engagements that aligned with registrars' needs promote learning.	
The quality of non-family physicians' supervision was department dependent.	Supervision is context-dependent.
The quality of supervision was inadequate at some sites.	
Patient interactions promoted registrar learning.	Interpersonal learning opportunities need to be maximised.
Interactions with supervisors promoted learning.	

The registrars were not using all available peer-learning opportunities.	
The registrars were not using all available interprofessional learning opportunities.	
Involvement in staff and student training consolidated registrars' learning.	Active involvement in district activities consolidates learning.
Regular CME meeting attendance consolidated registrars' learning.	
Participation in district management and patient safety meetings consolidated registrars' learning.	
Registrars displayed a lack of professionalism.	Registrars should take more responsibility for their learning.
Self-reflection promoted registrars' learning.	
Registrars did not optimally use the learning portfolios.	
Registrars did not adequately engage with supervisors' feedback.	
Supervisors' feedback was insufficient and inadequate.	The nature and extent of feedback influence supervision and learning.
Non-family physicians provided better feedback than family physicians.	
The quality of assessments was inadequate.	The quality of assessments needs to be improved and standardised across the training districts.
Registrars' level of competence did not improve with years of training.	
The quality of assessments varied across the training districts.	
Registrars' competence levels varied widely across clinical core and elective skills.	The registrars displayed widely varying levels of clinical skills competence.
Registrars' competence levels varied across all family medicine domains.	
Registrars' competence levels varied across training years.	

The themes suggest shared responsibilities for all stakeholders in the programme, across all levels of management, both FP and non-FP supervisors and the registrars themselves. The themes in Table 9.1 were used to modify the initial logic model in Chapter 2 into the final logic model (Figure 9.1).

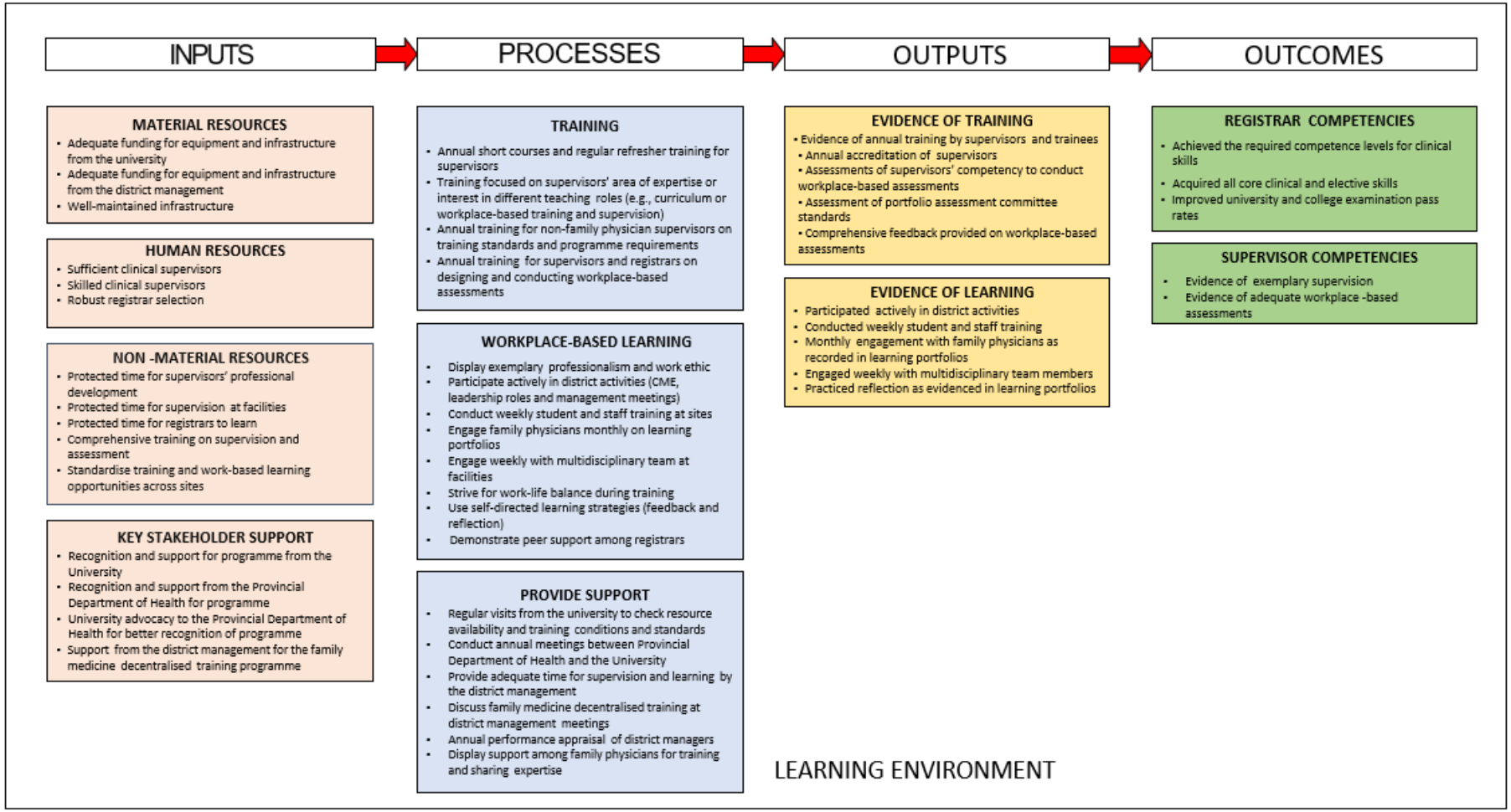

Figure 9.1: Final adapted logic model for the Wits University postgraduate family medicine training programme.

9.2. RECOMMENDATIONS ARISING FROM THE LOGIC MODEL

Specific, actionable recommendations from the final logic model (Figure 9.1) are discussed below.

9.3. INPUTS

9.3.1. Key stakeholder support is pivotal

A key stakeholder analysis was performed to better understand each key stakeholder's role. The roles were prioritised depending on the stakeholder's influence, power to change, and interest, using a recommended key stakeholder analysis tool.[7] Various stakeholders were recognised who could potentially influence successful programme implementation. These included Wits University Faculty of Health Sciences, including the Dean and other faculty heads, the head of the Department of Family Medicine and Primary Care, the SA Academy of FPs, and heads of department of FM units at various districts. Other key stakeholders such as National and Provincial Health Departments, heads of other disciplines in regional hospitals, heads of district management like chief directors, and hospital and facility managers may have influence but probably have lower interest in the decentralised FM training programme implementation. Other stakeholders with a high interest but less power are the end users, i.e., FPs and registrars. Lastly, the stakeholders with low influence and less interest could be non-FP supervisors like consultants in other disciplines, registrars in disciplines other than FM, or medical officers working in various district and regional hospitals involved in FM registrar training during their skills rotations. Other stakeholders with variable influence and interest regarding the training programme include professional nurses and multidisciplinary team members such as physiotherapists, psychologists, optometrists, and social workers. All these stakeholders should be considered and engaged at the right level for successful programme implementation.

The following recommendations are made to maximise support for the programme implementation from some of these identified key stakeholders:

- FP shortages should be urgently addressed by the National and Provincial health departments to improve trainer-trainee ratios, which are essential for an optimal learning environment.[8,9]
- The Department of Family Medicine and Primary Care and district management structures, who have direct oversight over DCT, should advocate for more support from the National and Provincial Health Departments.[10]
- The Department of Family Medicine and Primary Care must conduct regular site support visits to assess training conditions and standards to identify strengths and address deficiencies on the training platforms.
- The Faculty and the Provincial Health Departments must contractually stipulate joint appointees' training roles and job requirements for both FP and non-FPs when involved in decentralised training and supervision.
- Wits University must provide funding for adequate provision and maintenance of infrastructure, including equipment and reliable Internet access at DCT facilities.

District management support across all training sites is fundamental to standardise training. To this end,

- monthly district management meetings and discussions should include decentralised training as a standing agenda and should include discussion on FM and other clinical departments like nursing and allied health professions, which could improve the recognition and support for decentralised training programmes as a whole.
- district management should manage excessive workload and call duty hours to promote an enabling WBL environment.

9.3.2. Skilled supervisors are essential for successful programme implementation

Good supervisors possess excellent interpersonal and teaching skills, superior clinical knowledge and skills, exemplary professionalism, and provide role modelling opportunities and adequate feedback.[11,12] A good supervisor performs multiple roles,

but actual performance depends on their preference, allocated roles, and individual commitments.[13] The recommendations are that

- supervisors, both FPs and non-FPs, should be proficient in various clinical and educational supervisory roles and mentor trainees when needed. Mentoring assists trainees in achieving self-development, modifying behaviour, gaining knowledge and skills, and learning in a supportive relationship, which is different from educational supervision.[14]
- supervisors should address trainees' learning needs and stimulate self-reflection. All supervisors should emulate individual and collective engagements with good rapport and supervisor-trainee relationships at their sites.
- non-FP supervisors should maximise engagement during ward rounds and case presentations and when performing procedures by providing feedback, which are excellent examples of the cognitive apprenticeship model.[15,16] Supervisors should internalise the practices in all disciplines involved in DCT.
- the lack of supervision, poor quality of supervision, inadequate clinical knowledge and skills, insufficient role modelling opportunities, and poor supervisory interpersonal skills among FP and non-FP supervisors must be addressed across all sites.

9.4. PROCESSES

9.4.1. Faculty training on supervision and workplace-based assessments is critical

To teach efficiently, supervisor training, adequate subject knowledge, and medical expertise are essential.[17,18] Faculty members receive little or no training on teaching methods and are expected to have mastered the knowledge and clinical skills needed to train.[17] Supervisors need support for their personal and professional growth.[17,19] The recommendations are that

- supervisors need ongoing training on supervision and workplace-based assessments. One approach could be to train supervisors on the roles they will be expected to fulfil. Among FPs, educational and clinical supervisory

roles[20,21,22] differ across districts, and some FPs are engaged in curriculum and resource development; hence, the training could be tailored to the supervisor rather than a one-size-fits-all approach.[13]

- supervisors should achieve competencies or milestones to enhance personal and professional growth. Available frameworks developed by ACGME or other HICs to assess supervisor skills by self-assessment, seeking feedback, and peer assessments for lifelong growth and development[17,23] could be adapted for FP and non-FP supervisors involved in DCT.
- supervisors should attend the Wits University or SA Academy courses on postgraduate supervision. The College of FPs should be responsible for training supervisors on WPBA standards and giving feedback. Annual site visits by the SA Academy[24] or the university for supervisor accreditation should occur.
- training from Wits University or the SA Academy is essential. The training must be conducted in the districts and aim to train the maximum number of supervisors from various disciplines. Mentoring of FPs by experts from Wits University or FPs in other SA universities could be an option. Peer support and mentoring juniors by senior supervisors should be maximised.

9.4.2. Registrar workplace-based learning characteristics influence the success of the programme

Registrar professional values and behaviour are a priority among FCFP learning outcomes[25] as in other postgraduate training programmes.[26,27,28] Medical professionalism is about achieving proficiency in knowledge and skills, displaying fundamental values such as accountability, honesty,[29,30] self-directed learning behaviour,[31] and working collaboratively with other professionals.[30] The recommendations are that

- registrars' lack of professionalism and work ethic should be addressed more vigorously during training. According to this study, insufficient preparation for academic sessions, lateness to work or academic sessions, poor learning behaviour, and lack of sufficient knowledge and skills were examples of inadequate professionalism needing attention.

- registrars should engage with their LPs as a self-reflective tool for personal and professional growth. Flexible learner-centred format, ongoing mentorship and tailoring the LP to a particular setting[32,33,34] could improve utilisation. Regular registrar engagement by asking questions on what went well or not by supervisors, peer assessments, and self-assessments facilitated by supervisor feedback[35] should augment the use of LPs.
- registrars' informal WBL from complex patients, peers and supervisors should be maximised.[36,37] Registrars should understand that workplace learning occurs mainly during unintended, implicit, and unstructured engagements.[38]
- registrars' engagement with multidisciplinary teams must be maximised to promote collaborative practice and improve patient care.[8,39,40] Excessive workload, lack of motivation, inadequate supervisory engagement, and nonavailability of multidisciplinary teams at facilities should be addressed.
- registrars should train health workers such as medical students, clinical associates, internship and community service doctors, and mentor medical and nursing practitioners as this was an important WBL opportunity.
- active participation of registrars in district CME, mortality and morbidity, and management meetings is required to prepare them for their FP roles.[41]
- registrars' learning behaviour should be improved, such as accepting feedback and criticisms and self-reflection by feedback engagement.
- a robust selection of registrars with good baseline skills and knowledge is essential to produce good outcomes.

9.5. OUTPUTS

9.5.1. Good supervisory feedback is a hallmark of exemplary supervision

Registrar-supervisor engagement with adequate feedback provision augments self-directed learning by stimulating self-reflection.[42,43,44] Good supervisor feedback encourages the registrars' positive motivational beliefs and self-esteem.[45] The following recommendations should contribute to better feedback:

- Written feedback should address the registrar's professionalism, clinical skills and knowledge deficiencies and be more constructive than positive with

sufficient action plans.[46] Feedback should be specific, objective, and behaviourally focused with written action plans by trainees under supervisor guidance.[47]

- All supervisors should provide feedback about soft skills such as patient negotiation or clinical reasoning. Their feedback should address unprofessional behaviour.
- supervisor and registrar training on feedback characteristics is extremely important. Faculty training on theoretical understanding of feedback tools will effectively assist all supervisors in applying various feedback cycles according to registrar training years.
- FPs, like non-FP supervisors, should provide more comprehensive feedback.

9.6. OUTCOMES

9.6.1. Higher skills competence reflects good outcomes as evidence for learning

Self-assessed skills competence levels are proxy measures for registrars' skills acquisition and are vital for their 'assessments as learning.'[48]

- Registrars' variable skills competence levels across all FM domains should be addressed. Higher reported competence levels in some clinical skills compared to others should be evaluated to check whether this is due to inadequate learning opportunities across sites.
- Elective skills remained low across training years, needing further attention. Examples are reported skill competency levels on procedures such as vasectomy, intravenous pyelogram, culdocentesis and proctoscopy. Registrars' skill deficiencies and maintenance throughout the training years must be addressed.
- Contextualisation of skill sets based on rural and urban contexts could be a consideration.

9.6.2. Programmatic assessment at Wits University

Workplace-based assessments collate information from multiple data sources and triangulate them to make authentic final assessments for trainees' progression.[49] WPBA tools assess habitual performance in daily practice at the 'does' level of Miller's pyramid.[50] Qualitative studies provide information on general competencies such as professionalism and teamwork.[49] Quantitative evaluations assess the trainees' clinical knowledge and hard and soft skills, providing a comprehensive understanding of trainees' overall performance when combined with qualitative study results.

- Assessments for learning conducted by supervisors from the same site or juniors could compromise the quality of assessments. Hence, WPBAs should be performed by experienced assessors with adequate experience and competence. Adequate sampling of assessors and contexts increases the reliability of WPBAs.[49]
- Standardisation exercises to practise WPBA for various competencies with WPBA tools, such as mini-CEX, should be done more often across sites.
- Successful programmatic assessments must promote sufficient narrative feedback by supervisors, include multiple assessors and contexts, triangulate multiple data sources, and establish a competent assessment committee to make final decisions on registrar progression. These are essential components of competency-based assessments as described by van der Vleuten *et al*.,[51] which should be attained to improve assessment standards at Wits University. The Wits portfolio committee should function efficiently to decide on registrar progression across years. Wits programmatic assessment challenges, when addressed, would maximise WPBA robustness to support entrustment decisions on registrar fitness to practice.

9.7. THE LEARNING ENVIRONMENT

9.7.1. An enabling learning environment is crucial for the decentralised postgraduate training programme

Developing a learning culture is the commitment among all individuals within an organisation to promote a good learning ethos with mind, body, and soul to facilitate learning.[52] Meaningful learning occurs during active participation and negotiation on

the meaning of any learning activity between the trainees, peers, and trainers in communities of practice.[53] A good learning environment requires a learning culture in the workplace, support to the individual learner, roles of training faculty, and safe service provision.[54]

The learning culture was deficient in the Wits DCT programme, needing more support across training sites.

- Targeted projects to develop a learning culture with supportive leaders, educators, and clinical staff, as demonstrated in other contexts,[55] should be emulated. Recommendations on four areas for an optimal learning environment for an adapted Wits model are summarised in Figure 9.2.

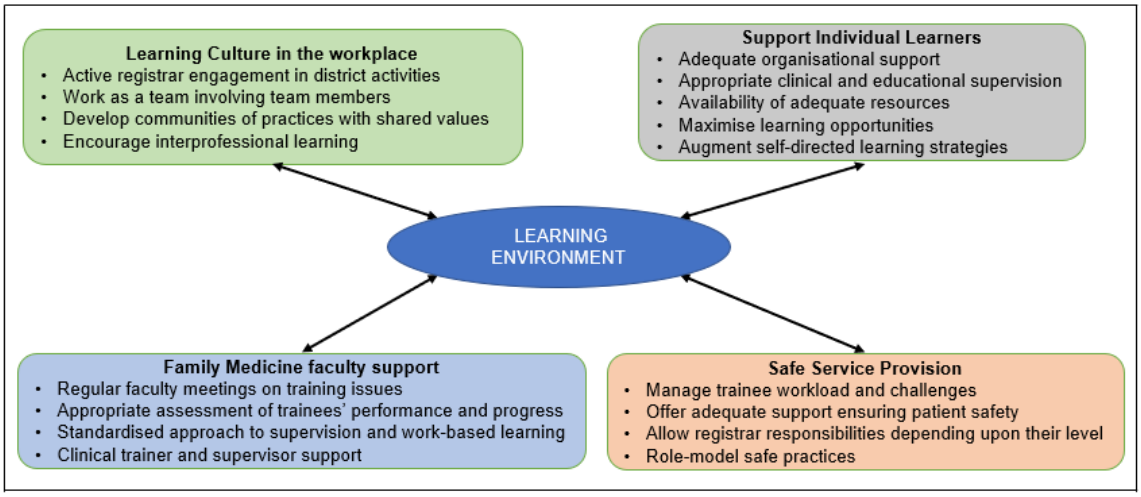

Figure 9.2: Requirements for a good workplace learning environment at Wits University's decentralised settings (adapted from NACT UK)[54]

- Excessive workload, work environment and patterns impacting Wits DCT by reduced modelling and WBL opportunities must be addressed.
- The need for standardised supervision, WBL opportunities, and resource provision must be addressed for an optimal learning environment. The DCT programme approaches cannot be precisely similar across sites, and programmes should make contextual adaptations. Although standardisation was essential, different supervisory and WBL approaches were implemented with varying interventions and adaptations according to what works best in

their contexts, which was even more critical. Successful examples should be shared across sites to strengthen DCT programmes.

9.7.2. Policy recommendations to improve the decentralised training programme

This study increased awareness of the challenges and gaps in the current Wits DCT programme. Evaluation studies should make positive contributions or action plans, whether the participants are prepared to do it or not.[56] The knowledge gained from this study must be used to improve the training programme by developing required policies or guidelines to address the gaps.

The policy recommendations or guidelines should be finalised in consultation with higher authorities such as the SA Academy of FPs, other SA universities with FM training and provincial health departments. They could be translated to other similar settings nationally. With official permission and contextual adaptations, existing policy documents could be adapted to the Wits University programme, as shown in Table 9.2.

- The national programmatic learning outcomes for postgraduate FM training were recently updated.[57] However, how learning outcomes can be achieved should be revisited for successful programme implementation at sites.
- Explicit policies on improved organisational support for DCT across all disciplines, including FM, are required in district health systems.
- Guidelines for educational and clinical supervisory roles and responsibilities and supervisor and registrar attributes required should be developed.
- The General Medical Council guidelines to address workplace challenges in postgraduate clinical supervision and training[58] could be adapted locally.
- Guidelines specifying roles and responsibilities of higher authorities and other organisational members and shared accountabilities of healthcare organisations[19,59] developed in other HICs could be adapted to Wits DCT.
- Clarifying roles for members involved in DCT, up to the smallest training unit, such as a PHC facility in a district health system, is essential. A UK faculty

guide clarifying the supervisory roles of organisational members in a learning environment[54] could be adapted. The terms used are:

- local faculty – those involved in the delivery of postgraduate medical education, like programme directors and clinical tutors
- faculty members – those with clearly defined roles and formally appointed and received training to perform the task
- extended faculty – every team member at sites where DCT occurs

Clarifying the roles for local and extended faculty members with training on these roles could improve the Wits DCT programme.

Table 9.2: Guidelines developed in HICs that could be adapted to the Wits University training programme

Areas identified for improvement	Recommendations	Guidelines from HICs
The roles and responsibilities of clinical and educational supervisors are not clear.	More clarity on supervisor roles and responsibilities needs to be provided.	Enhancing supervision for postgraduate doctors in training.[19] A reference guide for postgraduate speciality training in the UK.[59]
Supervisory behaviour and trainee professionalism are inadequate.	Develop guidelines for supervisory behaviour and trainee professionalism.	ACGME Program Requirements for Graduate Medical Education in Family Medicine.[27] General professional capabilities framework. General Medical Council.[28]
Trainees' support and well-being during the training.	Documented guidelines to support trainees' well-being.	The state of medical education and practice in the UK.[58]
Supportive workplace-based learning environment.	Develop guidelines for an optimal learning environment.	NACT Faculty guide - The Workplace learning Environment.[54]

The study findings confirmed the 'thought experiments'[60] I had at the start of this study. Returning to my personal, practical and intellectual goals,[60] I gained an in-depth understanding of the Wits DCT programme and how and why it rolled out differently into various decentralised sites. Most importantly, it is an explanation for my practical goal on how to improve current postgraduate training standards. I will pursue these goals with the necessary support and guidance from the Wits FM department to achieve the highest possible standards in the DCT programme. Although I was released from the academic district coordinator role in the Ekurhuleni

Health District during my study period, taking back more active roles will assist me in providing leadership and governance in DCT at the district where I am based. I have already started my active engagement in Wits University training activities by disseminating findings from this study and engaging FP and non-FP supervisors involved in DCT about areas that can be strengthened. The dissemination of the findings includes me, as the chairperson of the Wits University FM portfolio committee, addressing the current challenges being experienced with the LPs. The support of other committee members will be required for ongoing monitoring and evaluation of how the LPs are used. The need for strengthening critical aspects such as supervision, feedback, WBL, and WPBAs identified in this study will be taken forward with relevant stakeholders to improve the DCT in FM and other disciplines.

Overall, the study enhanced my personal and professional growth in my committed journey as a clinical trainer and supervisor and also enriched my research skills. I gained a better understanding of the research philosophy and paradigms, various research methodologies and their strengths and challenges, mixed method typologies, case study as an approach, and various integration methods and their usefulness to strengthen research findings, which I will advance further doing more research in the future.

9.7.3. Reflections on the impact of the pandemic on the study

Despite face-to-face interviews being planned initially, most of them turned out as electronic interviews due to the COVID-19 pandemic. Access to FPs and registrars during the time of the pandemic was another unanticipated challenge during the time of data collection. During the electronic interviews, internet connectivity challenges were unavoidable. The pandemic affected the patient flow to clinics and hospitals, reducing adequate registrar exposure to patients and negatively influencing their experiential learning. Registrars' skills rotations were minimised, or time for allocations was reduced, which may also have contributed to the incompleteness of their skills as reported in their LPs. Among the supervisors, the time for supervision, training and WPBAs was significantly reduced due to increased multiple responsibilities, which may also have affected the study results.

9.7.4. Reflections on using complex programme evaluation logic model

Compared to previous programme evaluation studies using other models,[61,62,63] the complex programme evaluation logic model had multiple advantages. The study explored important medical education concepts such as postgraduate clinical and educational supervision, registrar WBL, and WPBAs that were initially planned to be evaluated simultaneously. Triangulation of multiple data sources provided an in-depth understanding of each concept, augmenting the feasibility and strength of the study findings. Thus complex programme evaluation logic model provided a comprehensive understanding of multiple factors, their interrelationships, and how they influence program implementation as a whole.[64] Several new factors, areas of strengths and challenges, and additional relationships between the concepts evolved using this model. The model developed in this study in this programme evaluation displays the characteristics of an effective logic model – sequential and consequential progression, effective communication, and providing insight into complex programmes.[64]

The weaknesses of the complex logic model used in this study were that despite some factors being evaluated in depth, all possible factors across the inputs, processes, and outputs could not be explored simultaneously. Although a few short-term outcomes were evaluated, some long-term impact factors such as patient satisfaction, registrar practices as FPs, and performance indicators for the district health system were not evaluated and provide areas for future research.

9.7.5. Reflections on the case study design

Case studies are appropriate for evaluating complex programmes in medical education.[65,66,67] Case studies facilitate comprehensive programme evaluations requiring multiple questions about inputs, processes, and outputs, and numbers and narratives for in-depth understanding.[68] Within this case study, multiple cross-sectional sub-studies were used to evaluate whether the multiple components of the FM training programme were adequate, as expected from evaluation studies.[68,69]

Case studies allow qualitative and quantitative methods to be combined,[65] allowing a variety of mixed methods approaches in which one method (qualitative or quantitative) is dominant and the other supplementary.[66,70] Combining qualitative and quantitative methods and analysing the data separately negated the shortcomings of each, while triangulation allowed a broader understanding of the phenomenon of interest.[65,68] Presenting the results in different chapters using a variety of formats, such as patterns or themes, data displays, narratives, and explanations, was an added strength of the study.

Finally, integrating the results from the datasets and checking for convergence, divergence, contradictions, or relationships[71] increased the validity of the meta-inferences. Although the generalisability of case studies has been questioned,[72,73] several methods were used to improve the generalisability of the study, including thick description and triangulation.

9.8. CONCLUDING STATEMENTS AND FUTURE DIRECTIONS

Research may contribute to new knowledge in the form of policy development, changes in practice, and theory development.[74] The model developed in this study has implications for future educational research, policy development and educational practices in postgraduate FM DCT.

9.8.1. Implications for educational research

This research addressed the critical gap of 'evaluating how we deliver primary care education by using robust research methodologies and applying theoretical frameworks.'[75] The study evaluated the Wits postgraduate FM DCT programme within a complex programme evaluation logic model, focusing on specific processes such as supervision and WBL opportunities in the clinical context and WPBAs. The study explored each educational concept, identifying various strengths and challenges that influenced each concept. The final adapted logic model expanded the meanings of each medical education concept chosen in the initial conceptual

framework about the ‘phenomenon of interest’, i.e., ‘decentralised FM training at Wits University.’ This model could be applicable or adapted to DCT contexts of other district health systems.

9.8.2. Implications for policy development

The utilisation or application of the qualitative components of evaluation studies is vital.[56] This study enhanced awareness among the participants about the issues they face so that they could start thinking about how to solve these. This case study offered several policy recommendations to improve the postgraduate FM DCT programme. The key stakeholders should provide adequate support and leadership at various levels for implementing them. The critical need for explicit policy guidelines on organisational support, supervisory roles and responsibilities, supervisory behaviours, registrar professionalism, and an optimal learning environment must be addressed by key stakeholders such as the SA Academy, the provincial health departments, and representatives from FM departments of all SA universities nationally.

9.8.3. Implications for educational practices

This study offered several recommendations emphasising the need for skilled FPs with exemplary teacher, physician, and personal characteristics for a successful training programme, ongoing faculty support of FP supervisors and other non-FP supervisors and training on clinical and educational supervision, mentorship, WPBAs, e-learning portfolio, and other clinical and research skills for supervisors and registrars. Adequate baseline knowledge and skills, exemplar professionalism and work ethics, and good self-directed learning behaviours are pivotal in achieving superior outcomes among registrars.

Adequate infrastructure, equipment and funding are essential to maintain optimal training standards at decentralised sites. Contextual variations and adaptations to best fit postgraduate supervision and supervisory feedback, WBL, and WPBAs with some level of standardisation across all training sites are crucial. Contextual factors

such as excessive workload, managing personal and family obligations with academic needs, availability of various levels of training facilities and complex patients are all essential. Registrars should be provided with adequate WBL opportunities for sufficient knowledge and skills acquisition. Most importantly, an enabling learning environment with a learning culture should be embedded among relevant stakeholders at all levels in these decentralised settings.

9.8.4. Future research recommendations

Future research on WBA of direct observations and feedback conversations, or video recordings of the supervisor-registrar engagements during direct observations will complement the field of postgraduate supervision. Qualitative studies with stakeholders like the heads of departments of other disciplines and district or facility managers may provide areas for further research. Regular audits on supervisor skills and deficiencies when involved as clinical trainers and quantitative surveys on resource availability will assist in understanding the extent of skills and resource shortages. Qualitative interviews with nurses, physiotherapists, psychologists, and other multidisciplinary team members on improving interprofessional learning opportunities in workplace-based contexts will be necessary for future research. The study evaluated the short-term outcomes of the programme. However, long-term impact studies on registrar practices as qualified family physicians, impact on health outcomes, patient care quality, or PHC health service delivery could add more knowledge on the effectiveness of DCT programmes in the broader health systems.

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APPENDICES

APPENDIX A. Interview schedule for Family Physicians

Reason(s)why information is required	Justification for information required	Main questions	Follow-up situations or probe questions
Demographics and training in the district			
To obtain baseline characteristics of the supervisors being interviewed.	Evaluator background is necessary in order to be able to describe the group of FPs as supervisors being interviewed.	*Let me start by asking about yourself, your qualifications and experience as a clinical trainer and supervisor.*	
		How old are you?	
		Nationality	
		In which district are you based?	Follow-up questions: How long have you been in this district? Where were you before? How long were you there for?
		What is your current position in the district?	Prompt with HOU/ Specialist, grade 1-3/and district education co-ordinator
		Do you have any postgraduate qualification/s	Follow-up questions: What are your qualifications? Where did you obtain them?

		Have you completed any postgraduate degree/diploma programme in postgraduate medical	If “yes”, please explain about your training If “no”, are there any reasons for not doing
		Have you attended any short courses or training on medical education?	If “yes”, which short courses are they If “no”, what are the reasons for not attending
Role of Family Physician as a clinical trainer			
To obtain more information about the different roles of Family Physician.	It is necessary to explore more on the roles of FP as a clinical trainer and supervisor in the district	*The wording of this question will depend on the supervisor role and experience as a clinical trainer* Tell me more about your role as family physician in your district?	How would you describe your roles on the six identified roles of family physician as a clinical care provider/consultant and in leadership and governance? Follow up questions How would you describe your involvement in the patient care? What is your experience in leadership and governance role at the facility? Have you had any experience of training registrars and students? Can you explain further on your role as a clinical trainer and supervisor at your workplace?

		What did you think are the strengths in your role as a clinical trainer?	
		What are challenges do you experience in your role as a clinical trainer?	
		What do you think about your own skills as a clinical trainer and supervisor? Do you think you have adequate support from the University to improve your skills as a clinical trainer or supervisor?	Follow up question If you think adequate or good, explain further If you think inadequate or bad, explain further Follow up question If you think adequate or good, explain further If you think inadequate or bad, explain further
Description of the decentralised training at the regional training centre			

To obtain detailed information of decentralised training in regional training centre of each district	To understand the structure and contents of decentralised training at regional training centre	Can you describe the registrar-training programme in your district?	*Give respondent time to think about the training programme then ask probe questions:* *F*ollow up questions What is the frequency of your regional training programme? How often do you meet the registrars?
		What content is covered in the training sessions at your regional training centre	In your district, how do you decide on the topics for your training programme If not sure, *Follow up question*, What is the topic for your previous training session? What constitutes the structure of your training programme at the training centre? (rephrase as Would you like to talk about the structure of a training day at the centre?

		Do you have training sessions with your registrar in your based PHC clinic?	*If respondent answers "yes" probe further:* Follow up with How often do you have training in your based PHC clinic? What is the structure of that training that you have at the clinics? Have you had any one-on-one sessions with your registrar? If yes, would you like to explain what happens in that session? Have you had any other forms of training sessions with your registrar? If yes, please explain further What are the strengths of your training programme at your PHC facility? What are the challenges you faced in your training programme at your PHC?
Perceptions of family physicians on specific processes in postgraduate FM decentralised training			

To obtain information about FPs perceptions on specific processes of decentralised registrar training programme	Will provide good insight of FPs into perceptions on specific processes	A. Supervision in the district Do you have any registrar(s) that you are supervising in your district currently?	How many registrars are you currently supervising?
		1. Regional training centre How will you describe your supervision of registrar training at the regional training site?	*If not sure, follow up question,* Have you perhaps participated in any of the training sessions at the regional training centre? If No, what were the reasons that you couldn't participate? If "yes", follow up with Would you like to tell me more about those sessions? What did you find more useful in those sessions? What are the aspects that you thought you need to improve?

		How do you supervise registrars for achieving the five national unit learning outcomes of FM training	*If not clear of FM unit learning, follow up question* One of the learning outcomes is biopsychosocial approach. What does that mean to you? How do you achieve that in your training? Follow up questions, Another one is Family oriented primary care, what does that mean to you How do you train them on family oriented primary care? Is there any other learning outcome that you train them on? Follow up questions If any of the learning outcome is mentioned, ask further How do you train them on community oriented primary care or ethics and professionalism or teaching and learning?
		Have you heard about the clinical topics and non-clinical topics in registrar training?	If “yes”, Follow up questions How do you supervise on clinical topics in the training? How do you supervise on the non-clinical topics in the districts?
		Are you aware of the e-learning or online training programme of registrars training	Follow up question If “Yes”, please tell me more about how did you use the e-learning or online training programme? If “No”, why haven’t you use it?
		2. PHC clinic	

		How do you supervise the registrar activities at your clinic?	Follow up question Have you observed any strengths on your supervision at PHC level? Have you experienced any challenges in supervision at PHC?
		3. District hospital rotations	
		How do you supervise your registrar(s) activities while on skills rotations in the district hospital?	*Follow up question*, What is your experience on supervising registrars while on district hospital rotations? Have you had any challenges on their supervision?
		4.Regional / tertiary hospital rotations	
		How do you supervise the registrar activities while the registrar is on skills rotation in the regional or tertiary hospital?	*Follow up question*, What is your experience on supervising registrars while on regional hospital rotations? Have you had any challenges on their supervision?

		5. Learning portfolio Let us talk about the learning portfolio now.	If not sure, ask Are you currently involved in supervising learning portfolio of a registrar in your district? If “yes”, Follow up questions’ How frequently do you have sessions with your registrar? What are the discussions that come up during these sessions? How do you make sure the activities needed for the portfolio are done by the registrar?
		How do you supervise the registrar(s) learning plans during the year?	
		How do you make sure the different direct observation tools needed for the portfolio are done by the registrar?	Have you used Mini-CEX or DOPS or COT tool of the portfolio for the registrar? *Follow up question*, If “yes,” Would you like to tell me how do you use them? *Follow up question*, If “no,” Would you like to tell me why they are not used?
		How do you supervise the registrars’ logbook skills?	Follow up question How do you make sure the skills completed are the skills that are actually done by the registrars (validity)
		Have you experienced any strengths in supervision of portfolio requirements?	If “yes”, please explain further If “no”, please explain further
		What are the challenges that you experienced in the supervision of portfolio?	

		How often do you give feedback to your registrars that you are supervising?	*Follow up question* Have you had any experience of using any feedback cycles when you give feedback to registrars? *If respondent answers "yes" probe further.* *If respondent answers "no" probe further* *How else do you give feedback to your registrar?*
		B. Learning behaviour and environment	Start saying, let us now focus on the registrar learning as opposed to the teaching
		How would you describe the learning environment for registrars within the district?	Do you think registrars have a good learning environment in district sites? *Follow up question*, If you think "yes," explain why do you think so *Follow up question*, If you think "no." explain why do you think so?
		What are the learning opportunities for the registrars in the district?	Do you think there are adequate learning opportunities for registrars in the district? Follow up question, If you think "yes," please explain why you think so If you think "no" please explain why you think so
		What do you think about the learning behaviours of registrars in the district training sites?	Do you think the registrars have good learning behaviours within the district? *Follow up question*, If "yes," why do you think so? If "no," why do you think so?

		What do you think about the opportunities for interprofessional learning in your district? OR Are there sufficient opportunities for interprofessional learning in your district?	*If not sure, IPL is the learning in the presence of other students, nurses and other health staff in the district)* Do you think interprofessional learning can improve registrar learning at your district? *Follow up question*, If you think "yes," why do you think so *Follow up question*, If you think "no," why do you think so
		What do you think about the use of portfolio is used as a learning tool by the registrars?	*If respondent answers "yes" probe further:* Why do you think so *if respondent answers "no*", please explain Why do you think so
		What do you think about the registrar's reflection on the feedback given to them?	*If respondent answers "yes" Why do you think so* *If respondent answers "no" Why do you think so*
		Do you think there are any other learning opportunities within the district?	*If respondent answers "yes" please explain further.* *If respondent answers "no" please explain further*
		Are you aware of any challenges for registrar learning within your district	*If respondent answers "yes" please explain further.* *If respondent answers "no" please explain further*
		C. Curriculum	Now I would like to talk about the curriculum of training in the district training
		What do you think about the curriculum for district registrar training?	*If unsure about, ask* Do you think it is too rigid or flexible or too broad curriculum in your district training? *If respondent answers "yes" probe further.* Please explain further *If respondent answers "no" probe further*

		How do you make sure that the curriculum is covered in your training sites?	*Follow up question* Do you think the college outcomes are covered adequately in the curriculum at the district? If you think “yes” please explain further
		What are the challenges in covering the curriculum at the district?	
		D. Assessments	Let me now ask few questions on assessments
		Tell me about the assessments that you do for the registrars in your district?	
		Have you used any formative assessment tools in your district?	*If not sure, formative assessments are assessments done by using direct observation tools such as Mini-CEX, Direct Observation of procedural skills* How often do you do mini CEX or DOPS assessments within your district? What are your strengths in doing formative assessments in your district? Have you encountered any challenges in doing formative assessments in your district?
		Are there any other forms of assessments other than using direct observations tool in your district?	*If respondent answers “yes” probe further* Please explain further *If respondent answers “no” probe further* Please explain further
		What do you think about the performance of registrars in formative assessments in your district?	*Follow up questions* Do you think the registrars are doing well in these assessments in your district? If you think “yes”, please explain further If you think “no”, please explain further

		What do you think about the final pass rate of registrars in college exams from your district?	*Follow up question* How do you feel about that?
		Do you provide any preparation session for college exams in your district?	Follow up question Can you tell me more about that?
		E. Support systems	
		What do you think about the support from district management for registrar training at your district?	
		Do you think there is adequate support from the district management with regards to Funding Infrastructure Equipment Wi-Fi /internet access	If you think “yes”, please explain further If you think “no”, please explain further

		Are there any other challenges on district management support for training in your district?	If you think “yes”, please explain further If you think “no”, please explain further
		What do you think about the support from the University for the training at your district?	
		Do you think there is adequate support from the university with regards to Funding Infrastructure Equipment Wi-Fi / internet access	If you think “yes”, please explain further If you think “no”, please explain further
		Are any other challenges on support for registrar training from the university?	If you think “yes”, please explain further If you think “no”, please explain further

APPENDIX B. Interview Schedule for Registrars

Interview schedule for interviews with registrars

Reason(s) why information is required	Justification for information required	Main questions	Follow-up situations or probe questions
Experiences of a registrar prior to joining on the training programme			
To obtain baseline characteristics of the registrar being interviewed.	Registrar background is necessary in order to be able to describe the group of registrars in training being interviewed.	*Let me start by asking you about your qualifications and experience as a medical officer and registrar*	
		How old are you?	
		Nationality	
		In which district are you based currently based	Follow-up questions: How long have you been in this district? Where were you before? How long were you there for?
		Where did you do your internship?	
		What is your post internship experience as a medical practitioner in South Africa?	
		Do you have any experience of working in primary health care (DH/ and or PHC) before joining the programme	Follow up questions How long have you been working in primary health care? Where did you work before?

		Did you do any postgraduate degree/diploma courses before joining the programme?	Follow up questions: What are your qualifications?
			Where did you obtain them?
Registrar perception on the role of Family Physician as a clinical trainer and supervisor			
To obtain more information about the registrars perceived roles of Family Physician as a clinical trainer.	It is necessary to explore the registrar perceptions on roles of FP as a clinical trainer and supervisor	*The wording of this question will depend on the supervisor role and experience as a clinical trainer as perceived by registrars* Tell me more about the role of family physician in your district?	Follow up with How would you describe the different roles of your FP supervisor in your district (as a clinical care provider / consultant / clinical trainer)? Follow up questions How would you describe FP involvement in the patient care? What is your experience of FP in leadership and governance role at the facility? Can you tell me about your experience of FP involvement in training registrars and students? Can you explain further on FP role as a clinical trainer and supervisor at your workplace?
		What do you think about the skills of your family physician as a clinical trainer and supervisor?	Follow up question If you think adequate or good, explain further If you think inadequate or bad, explain further

		What did you think are the strengths of your family physician as a clinical trainer?	
		What challenges have you experienced from your family physician on his role as a clinical trainer?	
Description of the decentralised training in each district by registrars			
To obtain detailed information decentralised training in regional training centre of each district	To understand the structure and contents of decentralised at regional training centre	Can you describe the registrar training programme in your district?	*Give respondent time to think about the training programme then ask probe questions:* follow up with questions What is the frequency of your regional training programme? How often do you meet the family physicians?
		What content is covered in the training sessions at your regional training centre	In your district, how do you decide on the topics for your training programme If not sure, *Follow up question*, What is the topic for your previous training session? What constitutes the structure of your training programme at the training centre? (rephrase as Would you like to talk about the structure of a training day at the centre?

		Do you have training sessions with your FP in your based PHC clinic?	*If respondent answers "yes" probe further:* Follow up with How often do you have training in your based PHC clinic? What is the structure of that training that you have at the clinics? Have you had any one-on-one sessions with your FP? If yes, would you like to explain what happens in that session? Have you had any other forms of training sessions with your FP? If yes, please explain further What are the strengths of your training programme at your PHC facility? What are the challenges you faced in your training programme at your PHC?
Perceptions of registrars on specific processes in postgraduate FM decentralised training			
		A. Supervision in the district	

To obtain information about registrar perceptions on specific processes of decentralised registrar training programme	Will provide good insight into registrar perceptions on specific processes	1.Regional training centre How will you describe registrar training at the regional training site in your district?	*If not sure, follow up question,* Have you perhaps participated in most of the training sessions at the regional training centre? If No, what were the reasons that you couldn't participate? If "yes", follow up with Would you like to tell me more about those sessions? What did you find more useful in those sessions? What are the aspects that you thought need improvement?
		What are the strengths that you had in your supervision by FP/'s at the regional training site?	

		Have you experienced any challenges in your supervision by FP at the regional training site?	*Follow up question* *If "yes", Would you like to tell me about that* *If "no", please explain further*

		Have you heard about the five national learning outcomes of training? How is your supervision by FP helps in achieving the five national unit learning outcomes of FM training?	One of the learning outcomes is biopsychosocial approach. What does that mean to you? How do you achieve that in your training? Follow up questions, Another one is Family oriented primary care, what does that mean to you How are you trained by FP on family oriented primary care? Is there any other learning outcome that you are trained by your FP? Follow up questions If any of the learning outcome is mentioned, ask further How are you trained on community oriented primary care or ethics and professionalism or teaching and learning?
		Have you heard about the clinical topics and non-clinical topics in registrar training?	If “yes”, Follow up questions How are you supervised on the clinical topics in the districts? How are you supervised the non-clinical topics in the districts?
		What is your experience on your supervision of e-learning topics?	Have you experienced any challenges in your supervision of e-leaning or online training programme
		Do you think you have provision to ask for more support when you have challenges on supervision to district or university?	Follow up question If you think “yes” explain further If you think “no” why do you think so
		2.PHC clinic rotations	

		How are you supervised by FP on registrar activities at your clinic?	Follow up question Have you observed any strengths on your supervision at PHC level? Have you experienced any challenges in supervision by FP at PHC?
		3. District hospital rotations	
		How are you supervised on your activities while on skills rotations in the district hospital?	*Follow up question*, What is your experience on supervision by FP while on district hospital rotations? Have you had any challenges on your supervision?
		4. Regional or tertiary hospital rotations	
		Do you rotate in regional or tertiary hospital for their skills rotation? How are you supervised by FP while you are on skills rotation in the regional or tertiary hospital?	What is your experience on your supervision by FP while on regional hospital rotations? Have you had any challenges on your supervision?
		5.. Learning portfolio	Let us talk about the learning portfolio now.

		How are you supervised on the portfolio requirements by your FP?	If not sure, ask Are you directly supervised by a FP on your portfolio in your district? If “yes”, Follow up questions’ How frequently do you have sessions with your family physician? What are the discussions that come up during these sessions? How do you make sure the activities needed for the portfolio are supervised by FP?
		How are you supervised on your learning plans during the year?	
		How do you make sure the different direct observation tools needed for the portfolio are supervised by FP?	What is your experience on using Mini-CEX or DOPS or COT tool of the portfolio by FP
		How are you supervised on your logbook skills?	Follow up question How do you make sure the skills completed are the skills that are actually done by you under supervision?
		Have you experienced any strengths in your supervision of portfolio requirements?	If “yes”, please explain further If “no”, please explain further
		What are the challenges that you experienced in the supervision of portfolio requirements ?	

		How often do you get feedback from your supervisor?	*Follow up question* What is your experience on getting feedback from your supervisor? *If respondent answers "yes" probe further.* *If respondent answers "no" probe further* *How else do you get feedback from your supervisor?*
		B. Learning behaviour and environment	Start saying, let us now focus on your learning as opposed to supervision
		How would you describe your learning environment within the district?	Do you think you have good learning environment in district sites? *Follow up question*, If you think "yes," explain why do you think so *Follow up question*, If you think "no." explain why do you think so?
		What are the learning opportunities for you in the district?	Do you think there are adequate learning opportunities for you in the district? Follow up question, If you think "yes," please explain why you think so If you think "no" please explain why you think so
		What do you think about your learning behaviours in the district training sites?	Do you think you have good learning behaviours within the district? *Follow up question*, If "yes," why do you think so? If "no," why do you think so?

		What do you think about the opportunities for interprofessional learning in the district sites? OR Are there sufficient opportunities for interprofessional learning in your district?	*If not sure, IPL is the learning in the presence of other students, nurses and other health staff in the district)* Do you think interprofessional learning can improve your learning at your district? *Follow up question*, If you think "yes," why do you think so *Follow up question*, If you think "no," why do you think so
		What is your experience of using portfolio as a learning tool?	*If unsure about it, ask* Do you think portfolio can used by you as a learning tool? *If respondent answers "yes" probe further:* Why do you think so *Follow up question*, *if respondent answers "no*" Why do you think so
		How do you reflect on the feedback given by your FP supervisor?	
		Do you think there are any other learning opportunities within the district?	*If respondent answers "yes" please explain further.* *If respondent answers "no" please explain further*
		Are you aware of any challenges for your learning within your district	*If respondent answers "yes" please explain further.* *If respondent answers "no" please explain further*
		C. Curriculum	
		What do you think about the curriculum for district registrar training?	*If unsure about, ask* Do you think it is too rigid or flexible or too broad curriculum in your district training? *If respondent answers "yes" probe further.* Please explain further *If respondent answers "no" probe further* Please explain further

		What are the strengths of the curriculum followed in your training site	*Follow up question* Do you think the college outcomes are covered adequately in the curriculum at the district? If you think “yes”, please explain further If you think “no”, please explain further
		Are you aware of any challenges in the curriculum followed at the district?	Follow up question If you think “yes”, please explain further If you think “no”, please explain further
		D. Assessments	Let me now ask few questions on assessments done in your district
		Tell me about the assessments that are done for the registrars in your district?	
		Have you used any formative assessment tools in your district?	*If not sure, formative assessments are done by using direct observation tools such as Mini-CEX, Direct Observation of procedural skills* How often do you do mini CEX or DOPS assessments within your district? What are your strengths in doing formative assessments in your district? Have you encountered any challenges in doing formative assessments in your district?
		Do you have any other forms of assessments other than direct observation tools in your district	*If respondent answers “yes” probe further* Please explain further *If respondent answers “no” probe further* Please explain further

		What do you think about your performance in formative assessments done in your district?	*Follow up questions* Do you think you are doing well in these assessments in your district? If you think yes, please explain further If you think no, please explain further
		What do you think about the final pass rate of registrars in college exams from your district?	*Follow up question* Do you think there is overall good pass rate for registrars in college exams from your district? If you think “yes”, please explain further If you think “no”, please explain further
		Do you provide any preparation session for college exams in your district?	Follow up question Can you tell me more about that?
		E. Support systems	
		What do you think about the support from district management for registrar training at your district?	
		Do you think there is adequate support from the district management with regards to Funding Infrastructure Equipment Wi-Fi /internet access	If you think “yes”, please explain further If you think “no”, please explain further

		Are there any other challenges on district management support for training in your district?	If you think “yes”, please explain further If you think “no”, please explain further
		What do you think about the support from the University for the training at your district?	
		Do you think there is adequate support from the university with regards to Funding Infrastructure Equipment Wi-Fi / internet access	If you think “yes”, please explain further If you think “no”, please explain further
		Are any other challenges on support for registrar training from the university?	If you think “yes”, please explain further If you think “no”, please explain further

Appendix C. Participant information sheet

Good day Sir/Madam. I am Dr Neetha Joe Erumeda, 1st year PhD student in Department of family medicine at Wits University and a Family Physician working in Department of Family Medicine at Ekurhuleni Health District.

As part of my studies, I have to undertake a research project. I am conducting a research project on 'Evaluation of postgraduate family medicine decentralised training programme at University of Witwatersrand, South Africa using logic model.'

The postgraduate family medicine full time registrar training programme was introduced in 2008 which rolled out differently in each of these districts depending on the inputs and context. It is now more than 10 years after the implementation and a good time to evaluate the programme. As part of this study, I would like to explore perspectives of family physicians and registrars on the inputs and processes such as supervision, assessments and learning that affects the postgraduate family medicine training. The findings of this study will help us to learn from the current practices and to make recommendations to the university and the district on how to improve the training.

As part of the project, I would like to invite you to participate in an interview to answer about 40-45 questions. The interview will take about 50-60 minutes. The questions asked will be about the inputs and the processes such as supervision, assessments and learning aspects of post graduate registrar training. If you agree, I would also like to record the interviews using an audio recorder.

Your participation in this study is fully voluntary. You may withdraw from this study at any time. You will not receive any direct benefits from participating in this research. There are no disadvantages or penalties for not participating. Your name and other details will be kept confidential at all times. The information given will be held securely. You will not be identified by name in any write up or in any publications of this study.

If you have any questions during or after about this research please feel free to contact me on 0820771981 or on email: Neetha.Erumeda@wits.ac.za. My

supervisor can also be contacted on (011 717 2587) or by email on: Ann.George@wits.ac.za. This study will be written up as a research report which will be available on university library website. If you wish to receive a summary of this report, I will be happy to send it to you.

The study has been approved by Human Research Ethics Committee (Medical), University of Witwatersrand, Johannesburg. If you have any queries, complaints or concerns regarding the ethical procedures of this study, you are welcome to contact the HREC (Medical), Chairperson Prof Clement Penny on Tel 011 717 2301 or on email : Clement.Penny@wits.ac.za.The telephone numbers of committee secretariat are 011 7172700/2656/1234/1252 or email on zanele.ndlovu@wits.ac.za and Mapula.Ramaila@wits.ac.za

Thank you for reading this study information sheet.

Yours sincerely

Dr N J Erumeda, Neetha.Erumeda@wits.ac.za, 0820771981

Dr Ann George, Ann.George@wits.ac.za, 0828709199

February 2020

PARTICIPATION CONSENT FORM

I, _____, hereby agree to participate in the study being conducted on evaluating the postgraduate family medicine decentralised training.

I agree to be interviewed.

I understand that my participation is entirely voluntary and that I can withdraw from the study at any time without any penalty or loss of benefits.

I understand that any information I disclose will be treated confidentially.

I understand that I can approach the researchers with any queries or concerns I may have at any stage of the study.

Signed: _____ at

_____ on _____

Appendix D. Participant consent form for audio recording of the interviews

I, _____, hereby agree to the recording of my interview with Dr Neetha Erumeda as part of the study she is conducting on evaluating post graduate family medicine decentralised training programme.

Signed: _____ at _____ on _____

Appendix E. Assessment tool on supervisor feedback in the learning plans

	Registrar 1		Registrar 2		Registrar 3		Registrar 4	
District								
Year of training								
Learning plans	LP1	LP2	LP1	LP2	LP1	LP2	LP1	LP2
Global score								
References to registrar's behaviour								
General								
Specific								
Statement indicating valence of feedback								
Positive								
Negative								
Comments offering strategy for improvement								
General								
Specific								
National								
Ability to rate feedback								
Direct								
Hearsay								
Number								
Signed								

Appendix F. Assessment tool for supervisor's feedback in mini-CEX sections

	Registrar 1			Registrar 2			Registrar 3		
	1	2	3	1	2	3	1	2	3
Registrar Year of training									
District where registrar is based									
Establish and maintain relationship									
No feedback									
Feedback given on areas done well									
Feedback on areas need improvement									
Gathering information									
No feedback									
Feedback given on areas done well									
Feedback on areas need improvement									
Physical examination									
No feedback									
Feedback given on areas done well									
Feedback on areas need improvement									
Clinical judgement									
No feedback									
Feedback given on areas done well									
Feedback on areas need improvement									
Explaining and planning									
No feedback									
Feedback given on areas done well									
Feedback on areas need improvement									
Shows well organised approach									
No feedback									
Feedback given on areas done well									
Feedback on areas need improvement									
Overall competence									
No feedback									
Feedback given on areas done well									
Feedback on areas need improvement									
General feedback									
No feedback									
Feedback given on areas done well									
Feedback on areas need improvement									
Ability to rate the feedback									
Signed and completed form									

Apppendix G. Evidence of learning tool

District where registrar is based		
Registrar Year of Training		
Marks obtained for university exams (if applicable)		
College exams (if applicable)	Pass	Fail
Quarterly assessment marks average		
Overall marks for Portfolio		

Marks obtained for Portfolio Sections

Learning Plans	Educational Meetings	Observations	Assignments	Logbook Skills Score	Overall Global Score

Competence and experience in skills of registrars

Clinical topic	Clinical skill	Competence A/B/C/D	Competence A/B/C/D	Experience (only on D score)			General comments (Supervision/ completion)
Adult Health		1st assessment	2nd assessment	< 5	5 to 10	> 10	
Perform common side-room tests	Use a glucometer						
	Use a haemoglobinometer						
	Perform a pregnancy test						
	Perform urinalysis						
	Venepuncture						
Adult health – General	Femoral vein puncture						
	Lumbar puncture						
	Routine intravenous access in adults						
	Lymph node excision biopsy						
	Perform point-of-care counselling and testing for HIV						
Adults – Musculoskeletal	Measure shortening of the legs						
	Aspirate and inject the knee joint						
	Inject tennis elbow or golfer's elbow						
	Interpret radiographs of joints and bones						
	Inject the shoulder and subacromial bursa						
	Inject trochanteric bursitis						
Adults – Abdomen	Incision and drainage of perianal haematoma						
	Interpret the abdominal radiograph in an adult						
	Proctoscopy						
	Interpret barium swallows						
Adults – Chest	Electrocardiogram set up, record and interpret						
	Interpret chest radiograph						
	Measure peak expiratory flow						
	Nebulise a patient						
	Pleural tap						
	Use inhalers and spacers						

	Perform and interpret exercise stress test						
	Perform and interpret office spirometry						
Adults – Urology	Penile block						
	Reduce a paraphimosis						
	Male medical circumcision						
	Drain hydrocele						
	Insert a urinary catheter						
	Insert a suprapubic catheter						
	Interpret intravenous pyelogram						
	Vasectomy						
Eyes, ENT, Skin							
Eyes	Excision of chalazion						
	Use a Schiotz tonometer						
	Fundoscopy						
	Instil drops or apply ointment						
	Remove foreign body from the eye						
	Test for squint						
	Washout of eyes (chemical burns)						
Ear, nose and throat	Assess hearing loss						
	Reduce a fractured nose						
	Remove a foreign body from ear and nose						
	Syringe, dry swab an ear						
	Take a throat swab						
	Manage epistaxis (cautery, packing)						
	Suture a pinna lobe						
	Drain a peritonsillar abscess						
Skin	Inject keloids						
	Phenol ablation of ingrown toenail						
	Excise sebaceous cyst (other lumps, bumps)						
	Apply a compression dressing to venous leg ulcer						
	Cryotherapy or cauterisation						
	Skin biopsy (punch and shave) or skin scrapes						
	Wide-needle aspiration biopsy lymph node						

Women's Health							
Pregnancy	Obstetric ultrasound						
	Interpret antenatal growth chart						
	Assess foetal well-being during labour						
	Episiotomy and suturing						
	Examine progress during labour and use partogram						
	Normal vaginal delivery						
	Apply and interpret the cardiotocograph						
	Assess foetal movement and counsel use of kick chart						
	Assisted vaginal delivery (vacuum extraction or forceps)						
	Caesarean section and management of bleeding						
	Evacuation of uterus						
	Manual removal of placenta						
	Repair of third-degree tear						
	Pelvic ultrasound (transvaginal)						
Woman's health	Culdocentesis						
	Hormone implants						
	Laparotomy for ectopic pregnancy						
	Termination of pregnancy (medical and surgical)						
	Insertion of intrauterine contraceptive device						
	Papanicolau smears/Liquid based cytology						
	Dilatation and curettage						
	Drainage/marsupialise Bartholin's abscess or cyst						
	Endometrial biopsy or sampling						
	Fine-needle aspiration biopsy of breast lump						
	Tubal ligation						
	Cervical polyp removal						
Newborn	Assess gestational age at birth						
	Counsel on Kangaroo mother care						
	Resuscitate a newborn						

	Umbilical vein catheterisation						
Consultation							
	Patient-centred consultation						
	Use genogram and eco-map						
	Develop and use flowcharts for chronic care						
	Motivate behaviour change						
	Assess and consult families, couples						
	Shared consultation to capacitate nurse practitioner						
	Counselling skills for HIV, termination of pregnancy, sexual assault						
	Break bad news						
	Mini–Mental State Examination						
	Use problem-orientated medical record						
	Conduct a family conference						
	Cope with language barriers						
	Holistic assessment and management						
	Sexual history and counselling						
Emergency care							
	Calculate % burn						
	Manage choking						
	Prescribe oxygen using a variety of devices i.e. nasal prongs, face masks, non-invasive CPAP						
	Immobilise the spine using blocks, straps, spinal boards, collars and spider harness						
	Insert an advanced airway i.e. endotracheal tube, laryngeal mask						
	Measure the Glasgow Coma Scale						
	Administer rabies prophylaxis						
	Advanced cardiopulmonary resuscitation – Adult						
	Advanced cardiopulmonary resuscitation – Child						
	Debride wounds or burns						
	Gastric lavage						

	Give a blood transfusion						
	Incision and drainage of abscesses						
	Insert chest drain						
	Insert nasogastric tube						
	Interpret radiographs in trauma						
	Emergency venous access i.e. intravenous cut down, femoral line						
	Manage snake bite						
	Primary survey						
	Relieve tension pneumothorax						
	Remove a foreign body from skin i.e. splinter, fish hook						
	Secondary survey						
	Selecting emergency equipment for doctor's bag or emergency tray						
	Debride and suture lacerations						
	Prepare and stabilise a critically ill patient for transport						
	Cricothyroidotomy						
	Insert central line						
	Connect a patient to a ventilator and monitor the patient						
	Perform cardiac pacing using chemical or mechanical means						
	Perform synchronised cardio version						
	Perform arterial sampling: adult and child						
	Classify patient according to triage system						
Orthopaedics							
	Apply finger and hand splints						
	Apply casts to upper and lower limb						
	Closed reductions on hand, forearm, tibia, fibula						
	Set up skeletal and skin traction						
	Reduce elbow dislocation						
	Reduce hip dislocation						
	Reduce radial head dislocation						
	Reduce shoulder dislocation						

	Excise ganglion						
	Amputations – fingers						
	Apply club foot cast						
	Debridement of open fractures						
	Emergency fasciotomy						
Anaesthetics							
	Injections – intra-dermal, subcutaneous, intramuscular, deep intramuscular						
	Ring block						
	Check Boyle's machine						
	Control airways with mask						
	General anaesthetic (inhalation and intravenous induction)						
	Intubate and ventilate patient						
	Ketamine anaesthesia						
	Monitor patient during anaesthetic						
	Monitor patient during recovery						
	Reverse muscle relaxation (mixed drugs)						
	Select an appropriate circuit – Magill Circle, T-piece						
	Spinal anaesthetic						
	Ventilate patient using mask and bag						
	Biers block						
	Brachial block						
	Administer conscious sedation and monitor the patient						
Child health							
	Assess growth and classify malnutrition						
	Capillary blood sampling – finger and heel						
	Assess chest radiograph in child						
	Developmental assessment						
	How to do and interpret Tine and Mantoux tests						
	Intraosseous line						
	Intravenous access in a child						
	Lumbar puncture in a child						

	Manage problems using the integrated management of childhood						
	Suprapubic bladder puncture						
	Venepuncture – upper limb and external jugular vein						
	Manage neonatal jaundice with phototherapy						
Clinical administration							
	Complete sick certificates						
	Complete death certificates						
	Certify patient under Mental Health Care Act						
	Writing appropriate referral letters						
	Managing a clinic for chronic care, for example, HIV and ARVs						
	Perform work assessment and complete disability grant forms						
Forensics							
	Assess, manage and document drunken driving						
	Assess, manage and document interpersonal violence						
	Assess, manage and document sexual assault						
	Complete J-88 form following assault						
Palliative care							
	Counselling of a dying patient						
	Hypodermoclysis (subcutaneous infusion)						
	Set up a syringe driver						
Clinical governance							
	Contribute to the development or revision of guidelines						
	Facilitate the implementation of clinical guidelines within the subdistrict						

	Improve quality of care by facilitating quality improvement cycles (including the audit of clinical care as one step in the cycle)						
	Improve cost-effectiveness through reflection on routinely collected data, particularly rational prescribing and use of investigations						
	Build capability and quality care through teaching, training and mentoring						
	Critically appraise new evidence						
	Appraise the competence of new clinicians and set appropriate levels of independence versus support						
	Evaluate the quality of care in relation to the relevant clinically orientated national core standards						
Community-oriented primary care							
	Do a home visit						
	Make a community diagnosis, and interpret and prioritise health indicators						
	Promote health in communities						
Teaching and training							
	Plan and implement a teaching or continuing professional development activity						
	Use a portfolio of learning						
	Mentor a colleague						
	Facilitate small group learning						
	Prepare and give a presentation						

Appendix H. Example of a learning plan

Period: from ……..…… to ……..…….……

Experience expected during this period, e.g. working one day per week in a primary care clinic, doing a home visit, or visiting a palliative care facility, working in the ARV clinic, and/or working in the maternity ward and doing calls in the EC and throughout the district hospital (Keep the 5 national unit standards in mind). Also, who is my local health team?

……
……
……
…
……
…….

Learning Objectives:

Reflect on your prior learning that is relevant to this next period of training and write it down here.

……
……
……
…
……
……
……
…
……
……
……

For this period, complete the table below:

National Learning Outcomes	Learning needs/objectives	Planned activities to meet these objectives	Timelines, Support and Resources required to meet these objectives	Evaluation (how will you know if these objectives have been met, suggested tools)
1. Effectively manage him/herself, his/her team and his/her practice, in any sector, with visionary leadership and self-awareness, in order to ensure the provision of high-quality, evidence-based care.				
2. Evaluate and manage patients with both undifferentiated and more specific problems cost-effectively according to the bio-psycho-social approach				
3. Facilitate the health and quality of life of the family and community.				
4. Facilitate the learning of others regarding the discipline of family medicine, primary health care, and other health-related matters				
5. Conduct all aspects of health care in an ethical and professional manner				

... Supervisor Feedback (meet at least twice)

.....

……

……
……
……
……
……

C. Date of next meeting to review progress ……

	Date	Signed registrar	Signed supervisor
Meeting1			
Meeting2			

D. Supervisor Assessment (ringed)

Assessment	2	1	0
1. Drawn up and discussed with supervisor	Within 1st month of new clinical allocation	Beyond 1st month of allocation	Towards the end or not at all
2. Shared within team	Yes, visibly	Mentioned, but not visible	not
3. Revisited and updated	At least twice	At least once	Not at all
4. Takes national outcomes and district health plan into account	Clearly	Partially	Not at all
5. SMART	Clearly (all 5)	Partially (some)	Almost not at all

Grade……/10

REFLECTION ON ALLOCATION 1

Name of allocation(s): _____

Allocation started _____ and ending_____

Name of health facility: _____

Type of health facility (please indicate):

PHC District hospital Regional hospital L3 Hospital Other (e.g. TB/ Psychiatry)

Clinical area(s) covered in this allocation (please tick all that apply):

Adult medicine Infectious Diseases (HIV/TB)

Women's Health	Surgery		
Child Health	Orthopaedi	☐	☐
Anaesthetics	Emergenci	☐	☐
ENT Eyes		☐	☐
Dermatology	Psychiatry	☐	☐
Other (specify)		☐	

Provide a brief description of your duties, patient profile and patient numbers personally managed in this allocation.

Reflect on your experience as a registrar working in this facility during this allocation, what worked well and what could be improved?

Reflect on your learning during this allocation. What has been learnt? What remains to be learnt? (Refer to the Learning Objectives in your Learning Plan.)

Registrar _____ (Signature) Date: ___	Leave days:

CONTINUOUS ASSESSMENT DURING THIS ALLOCATION BY MY SUPERVISOR

(To be completed by supervisor and discussed with registrar)

Marking scale: 9–10 = excellent; 7–8 = above average; 5–6 = average/satisfactory; 3-4 = below average/unsatisfactory; 1–2 = very weak; N/A = not applicable or don't know

	Score 1 – 10
KNOWLEDGE	
Clinical medicine	
SKILLS	
Clinical record-keeping: case-notes, letters, summaries	
Rational prescribing and use of medication	
Rational use of diagnostic tests and resources	
Co-ordination of patient care with multiple providers	
PROFESSIONAL VALUES AND ATTITUDES	
Approach to ethical and medico-legal issues	
Punctuality, time keeping and reliability	
Relationship with other team members	
Leadership abilities	
Collaboration or consulting with other health professionals	
OVERALL ASSESSMENT	
Global rating (Give score for rotation ……/10)	/10

Feedback from supervisor:

Supervisor's name: _____

Signature:_____Date:_____

Appendix I. Example of a mini-CEX form

Evaluator:_____ Date:_____

Registrar:_____ FCFP exam: yes_____ no _____

Patient Problem/Dx:_____

Setting: O Ambulatory O In-patient O EC O Other_____

Patient: Age_____ Sex: _____ O New O Follow-up

Complexity: O Low O Moderate O High

Focus: O Data Gathering O Diagnosis O Therapy O Counselling

Establishes a good doctor-patient relationship (O Not Observed)

1 2 3 4 5 6 7 8 9 10

UNSATISFACTORY SATISFACTORY SUPERIOR

Gathering information (O Not Observed)

1 2 3 4 5 6 7 8 9 10

UNSATISFACTORY SATISFACTORY SUPERIOR

Physical Examination Skills (O Not Observed)

1 2 3 4 5 6 7 8 9 10

UNSATISFACTORY SATISFACTORY SUPERIOR

Clinical Judgement (O Not Observed)

1 2 3 4 5 6 7 8 9 10

UNSATISFACTORY SATISFACTORY SUPERIOR

Explaining and Planning (O Not Observed)

1 2 3 4 5 6 7 8 9 10

UNSATISFACTORY SATISFACTORY SUPERIOR

Shows a well-organised approach (O Not Observed)

1 2 3 4 5 6 7 8 9 10

UNSATISFACTORY SATISFACTORY SUPERIOR

Overall Clinical Competence (O Not Observed)

1 2 3 4 5 6 7 8 9 10

UNSATISFACTORY SATISFACTORY SUPERIOR

Mini –CEX Time: Observing_____Mins Providing Feedback:_____Mins

Total Score by your Supervisor ……./ 70 Divided by 7 ……./10

[or divided by total of competencies assessed, e.g. if 5 competencies, then …../50]

Feedback:_____

_____

_____

_____

_____

_____ _____

Registrar Signature Evaluator Signature

DESCRIPTORS OF COMPETENCIES DEMONSTRATED DURING THE MINI-CEX

Establishes a good doctor-patient relationship: Shows genuine respect, compassion, sensitivity, rapport, empathy, establishes trust, and attends to patient's comfort.

Gathering information: Explores the patient's problem(s) by effectively using questions, listening and facilitation skills and obtains sufficient information. Understands the patient's perspective. Understands the patient's context.

Physical examination skills: Performs a competent, focused examination, in an efficient and logical sequence. Elicits the correct and relevant physical signs.

Clinical judgement: Makes a correct, rational and holistic (3-stage) assessment. Chooses an appropriate and evidence-based management plan.

Explaining and planning: Clearly explains the assessment and management plan. Gives the patient an opportunity to ask for information / confirms patient's understanding. Involves the patient where appropriate in decision-making. Provides appropriate counselling when relevant.

Shows a well-organised approach: Ensures a structure and rational flow to the consultation, prioritises, is timely and efficient.

Overall clinical competence: Is the overall competency below, at or above the level expected for this assessment.

[Keep it short (<20 min), need not assess everything every time, do this regularly, ask for feedback, assess against FCFP exit exam standard (progress test)]

Adapted from the American Board of Internal Medicine, www.abim.org. Discussed in Norcini JJ, Blank LL, Arnold GK, Kimball HR. The mini-CEX (Clinical Evaluation Exercise): a preliminary investigation. Ann Intern Med 1995;123:795-9.

Further references: Mash B. How to communicate effectively in the consultation. South African Family Practice Manual (Mash and Blitz, Ed), 3rd ed. 2015: 464-466; and Blitz J. Communication Skills. Handbook of Family Medicine (Mash Ed), 3rd ed. 2011: 67-96.

Appendix J. Ethical approval

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R14/49 Dr NJ Erumeda

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M191140

NAME: (Principal Investigator)	Dr NJ Erumeda
DEPARTMENT:	School of Clinical Medicine Department of Medicine Division of Family Medicine Medical School University
PROJECT TITLE:	Evaluation of the postgraduate family medicine decentralised training programme at the University of Witwatersrand, South Africa, using logic model
DATE CONSIDERED:	2019/11/29
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Professor L Jenkins and Dr A George
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2020/03/12

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary 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 **November** and will therefore reports and re-certification will be due early in the month of **November** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature — Date: 20/03/2020

PLEASE QUOTE THE CLEARANCE CERTIFICATE NUMBER IN ALL ENQUIRIES

Appendix K. Approval to conduct research in Johannesburg health district

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

JOHANNESBURG HEALTH DISTRICT

Wits
Human Research Ethics Committee(Medical)
University of The Witwatersrand
Johannesburg, South Africa
Neetha.Erumeda@wits.ac.za

Enquiries: Dr EM Ohaju
Tel: 011 694 3888 Cell: 076 8831659
Email: Elizabeth.Ohaju@gauteng.gov.za

Hillbrow CHC: Administration Building
Cr Smith Str. & Klein Street
Private Bag X21, Johannesburg
South Africa, 2017

DRC Ref: 2019-12-010

NHRD Ref no: GP_201910_050

Dear: Dr Neetha Erumeda

Title: ***Evaluation of the postgraduate Family Medicine decentralised training programme at the University of Witwatersrand, South Africa, using the logic model***

Your application for the clinical trial refers.

The District Research Committee has reviewed your application. This letter serves as a recommendation to Gauteng Provincial Office to give the final approval letter for this clinical trial.

The facility to be visited: **CHIAWELO CHC, DIEPKLOOF PROV CLINIC, HILLBROW CHC, LILLIAN NGOYI CHC**

- This facility will be visited from **05/05/2020 to 05/05/2021**
- You will report to the Facility Manager before initiating the study.

Sub District	Sub District Manager/ Area Manager	Contact No.	Cell phone
ABCEF	Ms Matlala	011 440 1259	082 307 0267
D	Ms. Maria Mazibuko	011 674 1200	082 781 9919

The following conditions must be observed:

- Participants' rights and confidentiality will be maintained all the time.
- No resources (Financial, material and human resources) from the above facilities will be used for the study. Neither the District nor the facility will incur any additional cost for this study.
- The study will comply with **Publicly Financed Research and Development Act, 2008 (Act 51 of 2008) and its related Regulations**.

Appendix L. Approval to conduct research from Ekurhuleni Health district

City of Ekurhuleni

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

EKURHULENI HEALTH DISTRICT
RESEARCH PERMISSION

Research Project Title: Evaluation of the postgraduate Family Medicine decentralised training programme at the University of Witwatersrand, South Africa, using the logic model.

NHRD No: GP_201910_050

Research Project Number: 07/11/2019-03

Name of Researcher(s): Dr Neetha Erumeda

Division/Institution/Company: University of the Witwatersrand

Date of review by the EHDRC: 07 November 2019

DECISION TAKEN BY THE EKURHULENI HEALTH DISTRICT RESEARCH COMMITTEE (EHDRC)

- This document certifies that the above research project has been reviewed by the EHDRC and permission is granted for the researcher(s) to commence with the intended research project.
- Facilities approved for the research: Daveyton Main Clinic; Goba Clinic; Vosloorus Poly Clinic ; Kwa-thema CHC, Nokuthela Ngwenya CHC, Phola Park CHC, Ramokonopi CHC and Bertha Gxowa Hospital.
- Participants' rights and confidentiality must be maintained throughout the study period and when disseminating the findings.
- No resources (financial, material and human resources) from the health facilities will be used for the study. Neither the district nor the health facilities will incur any additional cost for the study.
- The study will comply with Publicly Financed Research and Development Act 2008 (Act 51 of 2008) and its related regulations.

Title: Evaluation of the postgraduate Family Medicine decentralised training programme at the University of Witwatersrand, South Africa, using the logic model.

- The EHDRC must be informed in writing before publication or presentation of research findings and a copy of the report/publications/presentation must be submitted to the EHDRC
- The district must be acknowledged in all the reports/publications generated from the research.
- The researcher will be expected to provide the EHDRC with
  - Six monthly progress updates including any adverse events
  - The final study report in electronic format
  - Present the final research findings at the annual Ekurhuleni research conference if possible.

- The EDHRC reserves the right to withdraw the approval, if any of the conditions mentioned above have being breached
- The research committee wishes the researcher(s) the best of success.

DR. J. SEPUYA

DEPUTY CHAIRPERSON: CITY OF EKURHULENI

Dated: 21/11/2019

Dr R Kellerman

CHAIRPERSON: GAUTENG DEPARTMENT OF HEALTH (EKURHULENI HEALTH DISTRICT)

Dated: 21/11/2019

Appendix M. Approval to conduct from Sedibeng district health services

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Enquiries: Dr. Victor Figueroa

Tel: 016 9506116
Cell: 082 3716077
1/6/2

TO : SEDIBENG DISTRICT MANAGEMENT

FROM : DR. VICTOR FIGUEROA – RESEARCH COORDINATOR

DATE : 04.02.2020

SUBJECT : CONSENT FOR CONDUCTING RESEARCH TO DR. NEETHA JOE ERUMEDA – EVALUATION OF THE POSTGRADUATE FAMILY MEDICINE DECENTRALISED TRAINING PROGRAMME AT THE UNIVERSITY OF WITWATERSRAND, SOUTH AFRICA USING LOGIC MODEL. PROTOCOL REF.NO: M191140

This is to certify that Dr Neetha Joe Erumeda, is a first year PHD student in the Department of Family Medicine at University of the Witwatersrand. As part of the PHD studies, it is a requirement to do a research project.

The title of the research project is an "**Evaluation of postgraduate family medicine decentralised training programme at University of Witwatersrand, South Africa using logic model.**"

I, Dr. Victor Figueroa in my capacity as Sedibeng District Research Co-ordinator recommend and support for permission to be granted to the above researcher.

Regards,

DR. VICTOR FIGUEROA
RESEARCH CO-ORDINATOR
SEDIBENG DISTRICT HEALTH SERVICES

DATE: 2020/02/04

GAUTENG PROVINCIAL GOVERNMENT
FAMILY MEDICINE UNIT
2020 -02- 04
PRIVATE BAG X023
VANDERBIJLPARK
SEDIBENG DISTRICT

Appendix N. Approval to conduct research from West Rand district

WEST RAND DISTRICT
FAMILY MEDICINE
Dr M. MAGETHI
Telephone: (011) 9516219
Cell: 0614845666
mmagethi@gmail.com

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

To: Dr. N. Erumeda

Email: Neetha.Erumeda@wits.ac.za

FROM: Dr Moshe Magethi

DATE: 20 October 2019

REF: NRHD GP_201910_050

PROJECT TITLE: **EVALUATION OF THE POSTGRADUATE FAMILY MEDICINE DECENTRALISED TRAINING PROGRAMME AT THE UNIVERSITY OF WITWATERSRAND, SOUTH AFRICA, USING THE LOGIC MODEL.**

Dear: Dr. N. Erumeda

We have received your application, delivered on 06/11/2019, to conduct research in the West Rand District Council. We are pleased to inform you that your request was assessed and approved subject to the following: you need to submit an HREC approval certificate before you can conduct your study in the District.
Take note that you will need to share your findings and recommendations with the district to assist with future clinical policies.

We wish you well during this project. For any additional information, feel free to contact our department.

Regards.

Dr Moshe Magethi

BsC, MBBCh (Wits); MMed Fam Med (Wits)
DA (SA); H.Dip Fam Med (SA); FCFP (SA)
Specialist Family Physician
Acting Head of Clinical Unit
West Rand District Council
Department of Family Medicine
University of Witwatersrand

Appendix O. Permission to conduct research from North West district

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

3801 First Street
New Office Park
MAHIKENG, 2735

Enq: Nthabiseng Mapogo
Tel: 018 391 4504
NMapogo@nwpg.gov.za
www.nwhealth.gov.za

POLICY, PLANNING, RESEARCH, MONITORING AND EVALUATION

Name of researcher : Dr. N.J. Erumeda
University of the Witwatersrand

Physical Address _____
(Work/ Institution) _____
_____

Subject : Research Approval Letter- Evaluation of the postgraduate family medicine decentralised training programme at the University of Witwatersrand, South Africa, using logic model.

This letter serves to inform the Researcher that permission to undertake the above mentioned study has been granted by the North West Department of Health. The Researcher is expected to arrange in advance with the chosen facilities, and issue this letter as proof that permission has been granted by the Provincial office.

This letter of permission should be signed and a copy returned to the department. By signing, the Researcher agrees, binds him/herself and undertakes to furnish the Department with an electronic copy of the final research report. Alternatively, the Researcher can also provide the Department with electronic summary highlighting recommendations that will assist the Department in its planning to improve some of its services where possible. Through this the Researcher will not only contribute to the academic body of knowledge but also contributes towards the bettering of health care services and thus the overall health of citizens in the North West Province.

Kindest regards

Dr. F.R.M. Reichel
Director: PPRM&E

DEPARTMENT OF HEALTH
OFFICE OF THE SUPERINTENDENT GENERAL
16 -03- 2020
PRIVATE BAG X 2068 MMABATHO, 2735

16/3/2020
Date

Researcher

Date

1

Healthy Living for All

Appendix P. Permission from the Wits University Registrar

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

OFFICE OF THE DEPUTY REGISTRAR

24 August 2020

Neetha Joe Erumeda
Student number (0110649J)
PhD Candidate
School of Clinical Medicine

TO WHOM IT MAY CONCERN

"Evaluation of the postgraduate family medicine decentralised training programme at the University of the Witwatersrand, South Africa, using Logic Model"

This letter serves to confirm that the above project has received permission to be conducted on University premises, and/or involving staff and/or students of the University as research participants. In undertaking this research, you agree to abide by all University regulations for conducting research on campus and to respect participants' rights to withdraw from participation at any time.

If you are conducting research on certain student cohorts, year groups or courses within specific Schools and within the teaching term, permission must be sought from Heads of School or individual academics.

Ethical clearance has been obtained. (Protocol number: **M191140**)

Research expiration: (12 March 2025)

Nicoleen Potgieter
University Deputy Registrar

Appendix Q. Permission from the Head of Family Medicine department at Wits University

DEPARTMENT OF FAMILY MEDICINE
UNIVERSITY OF THE WITWATERSRAND

Dear Dr Erumeda,

PERMISSION TO ACCESS MMED STUDENTS' PORTFOLIOS, MARKS AND ACADEMIC STAFF: DR N ERUMEDA, PhD CANDIDATE (WITS)

Your request for permission to access the portfolios of the MMed students and the academic staff in the Division of Family medicine for your PhD studies refers. Permission is also granted to access the information on the summative assessment marks (quarterly assessments and FCFP college examination results) of each registrar during the year.

This letter serves to confirm that permission is hereby granted for this purpose. This permission lasts for the next 5 years and ends October 2024.

Please note that this permission is granted for the purpose of your PhD (Family medicine) studies only. Furthermore, you are required to treat every information obtained from these portfolios and academic staff confidential and anonymous, both during your studies and in any reports / publications that may emerge from your study. You are also required to adhere strictly to the study conditions as stipulated in your ethics clearance.

On completion, the Division of Family medicine requests that a synopsis of your study and its findings be submitted to the office of the Academic Head: Division of Family medicine.

I wish you all the best in your academic endeavours.

29th October 2019

Prof OB Omole
Academic Head: Division of Family medicine

Date

Appendix R. Request for permission from registrar to access information Learning portfolio on supervisor feedback

From
Dr Neetha Joe Erumeda …/…/2019
1st Year PHD student
University of Witwatersrand
Ekurhuleni Health District

To
Registrar
Depart of Family Medicine
University of Witwatersrand

Dear Participant,
Request for permission to access information from the portfolio and assessment marks of the registrar
My Name is Dr Neetha Joe Erumeda, a first year PHD student in the Department of Family Medicine at University of the Witwatersrand.

I am conducting a research project called “Evaluation of postgraduate family medicine decentralised training programme at University of Witwatersrand, South Africa using logic model.” This study is aimed at evaluating the inputs, processes, outputs and outcomes of postgraduate FM training programme. As part of the information needed for the outputs and outcomes, I would like to do a retrospective record review of the portfolio submitted by registrars at the end of the year to collect information on supervision. The data will be collected using checklists and will be analysed across the various districts and three years of training. The participation in this study is voluntary and you can decide even not to participate without any consequences or loss of benefits. The confidentiality of the results will be maintained in all the work and publications not attaching any personal details to the results published.

The findings of this study will help us to look at the supervision and registrar performance from various districts in different years of training. This study will help to make recommendations to the university and district on how to improve the current decentralised training programme in all the districts.

_____

Dr N J Erumeda

Date ……

CONSENT FORM FOR ACCESSING MARKS AND INFORMATION FROM PORTFOLIO

I_____ hereby give consent for Dr Neetha Erumeda as part of the study she is conducting on postgraduate decentralised registrar training programme to access the marks and information from my portfolio.

:_____ _____

Participant signature

Date …….

Appendix S. Request from supervisors to assess feedback from registrar portfolios

From
Dr Neetha Joe Erumeda …/…/2019
1st Year PHD student
University of Witwatersrand
Ekurhuleni Health District

To
Family Physician
Depart of Family Medicine
University of Witwatersrand

Dear Participant,
Request for permission to access information on supervision from the portfolio of the registrar

My Name is Dr Neetha Joe Erumeda. I am a first year PhD student in the Department of Family Medicine at the University of the Witwatersrand.
I am conducting a research project called “Evaluation of postgraduate family medicine decentralised training programme at University of Witwatersrand, South Africa using logic model.” This study is aimed at evaluating the inputs, processes, outputs and outcomes of postgraduate FM training programme. As part of the information needed for the outputs and outcomes, I would like to do a retrospective record review of the portfolio submitted at the end of the year to collect information on supervisory feedback given by the family physicians to the registrars in the various sections of the portfolio. The data will be collected using checklists and will be analysed across the various districts and three years of training. The participation in this study is voluntary and you can decide even not to participate without any consequences or loss of benefits. The confidentiality of the results will be maintained in all the work and publications not attaching any personal details to the results published.

The findings of this study will help us to look at the supervision of registrars by family physicians in various districts and different years of training. This study will help to make recommendations to the university and district on how to improve the current decentralised training programme in all the districts.

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Dr N J Erumeda

Date

CONSENT FORM FOR ACCESSING INFORMATION FROM REGISTRAR PORTFOLIO ON SUPERVISION

I_____ hereby give consent for Dr Neetha Erumeda as part of the study she is conducting on postgraduate decentralised registrar training programme to access information on registrar supervision from the portfolio.

_____ _____

Participant signature Date

Appendix T. Request permission from registrars to access learning portfolio and university marks

From
Dr Neetha Joe Erumeda …/…/2019
1st Year PHD student
University of the Witwatersrand
Ekurhuleni Health District

To
Registrar
Depart of Family Medicine
University of the Witwatersrand

Dear Participant,
Request for permission to access information from the portfolio and assessment marks of the registrar
My Name is Dr Neetha Joe Erumeda, a first year PHD student in the Department of Family Medicine at University of the Witwatersrand.

I am conducting a research project called “Evaluation of postgraduate family medicine decentralised training programme at University of Witwatersrand, South Africa using logic model.” This study is aimed at evaluating the inputs, processes, outputs and outcomes of postgraduate FM training programme. As part of the information needed for the outputs and outcomes, I would like to do a retrospective record review of the portfolio submitted by registrars at the end of the year to collect information on supervision and the assessments. I would also access the information on your summative assessment marks (quarterly assessments and FCFP college exam as applicable). The data will be collected using checklists and will be analysed across the various districts and three years of training. The participation in this study is voluntary and you can decide even not to participate without any consequences or loss of benefits. The confidentiality of the results will

be maintained in all the work and publications not attaching any personal details to the results published.

The findings of this study will help us to look at the supervision and registrar performance from various districts in different years of training. This study will help to make recommendations to the university and district on how to improve the current decentralised training programme in all the districts.

_____

Dr N J Erumeda

Date ……

CONSENT FORM FOR ACCESSING MARKS AND INFORMATION FROM PORTFOLIO

I_____ hereby give consent for Dr Neetha Erumeda as part of the study she is conducting on postgraduate decentralised registrar training programme to access the marks and information from my portfolio.

:_____ _____

Participant signature

Date …….

Appendix U: Steps of integration analysis

Table 1: Data transformation – Chapter 7 Feedback (Qualitising of Quantitative results)

	Supervisory feedback	**Quantitaive 1**				
	Main result categories	**Main results**	**Synthesised Categories**	**Synthesised themes**	**Final synthesised themes form learning plans and Mini-CEX forms**	**Components of logic model**
Learning plans	***Quantity of feedback***					
	Registrar clinical knowledge and skills	61.2% did not refer to registrars' clinical knowledge or skills	Inadequate feedback on clinical knowledge and skills (learning plans)	Inadequate feedback characteristics	Inadequate feedback characteristics in learning plans and mini-CEX forms	Output
	Valence of feedback	41.7% had no feedback and 55.6% of feedback were either positive or negative and only 2.7% were constructive feedback	Inadequate constructive feedback (learning plans)	Inadequate feedback characteristics	Non-FPs supervised learning plans	Output
	Improvement strategy offered	86.1% of feedback did not offer an improvement strategy	Insufficient improvement strategy provided (learning plans)	Inadequate feedback characteristics	FP feedback focused more on hard than soft skills in learning plans and mini-CEX forms	Output
	Extent of supervisors' feedback	47.2% of the feedback was rated poor and 47.2% were rated average and only 5.6% were rated good feedback	Overall feedback was inadequate (learning plans)	Inadequate feedback characteristics	More FP feedback in mini-CEX forms than learning plans	Output
	Non-FP supervisor feedback	Non-FPs supervised and signed learning plans in 33.4% of the forms	Supervisors other than FPs supervised on learning plans	Supervisors other than FPs supervised learning plans	Non-FP supervisors provided more comprehensive feedback	Output
	Supervisor scoring	Global score median of 8.0 (7.7–9.0) out of 10.0	Lenient scoring (learning plans)	Linient scoring by supervisors	More feedback on soft skills from non-FP supervisors	Output
	Global score association	Global scores were associated with training year (p=0.012)	Global scores were dependent on year of training (learning plans)	Global score progression was evident across year of training	Lenient scoring	Output
	Association of feedback categories with year of training and training districts	Feedback categories not associated with training district or year of training	Feedback categories not dependent on training district or training year (learning plans)	Feedback provided in learning plans not dependent on training district or year of training	Same FP conducted all mini-CEX assessments (AfL) in some districts	Output
	Quality of feedback	Non-FPs provided more feedback than FPs (25.8 words versus 13.7 words)	More feedbck by other supervisors than FPs (learning plans)	More comprehensive feedback from non-FP supervisors	Score progression (global and total) was evident across training years in	Output

					learning plans and mini-CEX forms	
		No improvement strategy or action plan provided in feedback	Less improvement strategy or action plan provided (learning plans)	Inadequate feedback characteristics	Feedback provided in mini-CEX was dependent on training district but not on year of training	Output
	Content analysis of feedback	More FP feedback on 'work ethic' and 'clinical skills'	FP feedback focussed on hard skills (learning plans)	FP feedback focused more on hard skills and less on soft skills	Feedback provided in learning plans not dependent on training district or year of training	Output
		Non-FP provided more comprehensive feedback	Supervisors other than FPs provided more comprehensive feedback (learning plans)	More comprehensive feedback from non-FP supervisors		
		Non-FP provided more feedback on professional behaviour, teamwork and clinical reasoning	Supervisors other than FPs provided more feedback on soft skills (learning plans)	More feedback on soft skills from non-FP supervisors		
Mini-CEX forms	***Quantity of feedback***					
	Mini-CEX assessments (AfL) supervisors	Mini-CEX assessments were conducted by same supervisor in some districts	Multiple assessors were not involved in formative assessments (AfL) Mini-CEX forms	All formative Mini-CEX assessments (AfL) were done by same FP in some districts		
	Extent of supervisors' feedback	63.2% were rated poor feedback, 22.8% were rated average and 14% of forms were rated as good feedback	Overall feedback was inadequate Mini-CEX forms	Inadequate feedback		
	FP scoring	Total scores median of 6.8 (6.1–7.3)	Lenient on scoring in Mini-CEX forms	Lenient scoring		
	Association of scores with years of training	Total scores were associated with training year (p=0.049)	Score progression across year of training Mini-CEX forms	Total score progression was evident in mini-CEX across year of training		
	Association of feedback with training district	Significant association of feedback categories with training district	Feedback categories was dependent on training district Mini-CEX forms	Feedback provided in mini-CEX was dependent on training district but not on year of training		
	Association of feedback with year of training	No significant association of feedback categories with year of training	Feedback categories was not dependent on training year Mini-CEX forms	Feedback provided in mini-CEX was dependent on training district but not on year of training		

	Quality of feedback	More FP feedback in mini-CEX forms compared to learning plans	More feedback in mini-CEX assessments	More FP feedback in mini-CEX forms than learning plans		
		FPs provided more improvement stategy compared to learning plans	More feedback on improvement strategy in mini-CEX than learning plans	More FP feedback in mini-CEX forms than learning plans		
	Content analysis of feedback	FP feedback mostly offered on history-taking, physical examination and comprehensive management	More FP feedback on hard skills Mini-CEX forms	FP feedback focused more on hard skills and less soft skills		
		FP provided less feedback on negotiation skills and comprehensive assessment	Less FP feedback on soft skills Mini-CEX forms	FP feedback focused more on hard skills and less soft skills		

Table 2: Data transformation Workplace-based assessments (Qualitising quantitative results)

Result categories	Main results	Synthesised Categories	Synthesised themes	Final synthesised categories	FINAL SYNTHESISED THEMES	Outcomes
Assessment for learning						
Learning porfolio scores						
Total LP median scores	Total LP median score 76.3 and ranged 62.1-81.2	LP total scores median score was high (above 75%)	LP total scores median score was high (above 75%)	Registrars scores were varied in LP, QA and various LP sections	Registrars scored variably across LP and QA scores	Outcomes
Marks in various LP sections	LP sections median scores ranged from 0% to 100%	LP section median scores varied widely across training years	LP section median scores varied widely across training years	Score progression was evident in LP scores across training years	Score progression was evident in LP, but not in QA scores across training years	
Total LP median score across training years	Total LP mean score varied from 59.9% to 81% across years	Total LP median score was highest among third years	Second year registrars score highest for total LP score median		Registrar scores varied widely in LP not in QA across the training districts	Outcomes
Total LP median score across districts	Total LP mean score varied from 62.1% to 83.5% across districts	Total LP median scores varied widely across districts	LP median scores varied widely across districts	LP median scores varied widely across districts		Outcomes
Quarterly assessment scores						
Quarterly assessment scores	QA median scores 64.9 and ranged from 60.7-69.5	QA median score was 64.5%	QA median score was around 65%			
Total QA score median across years	QA median scores ranged from 61.4 to 67.3 across years	QA scores medians were highest among second years compared to third years	QA Score median was highest among second year registrars	Second years scored higher than third years in QAs		
Total QA score median across training districts	QA median scores ranged from 62.0 to 67.5 across training districts	QA scores medians were quite similar across the districts	QA scores medians were similar across the districts	QA scores medians did not vary much across the districts		Outcomes
Skills score competencies in learning portfolios						
Skills competence levels on each core clinical skill	Reported skills competency levels for all registrars for 205 core skills and 39 elective skills were individually assessed	Reported skills competency levels for all registrars for 205 core skills and 39 elective skills were individually assessed	Reported skills competency levels for all registrars for 205 core skills and 39 elective skills were individually assessed	Registrars reported varied skills competency levels across clinical 205 core and 39 elective skills	Regsitar skills competency levels varied widely across clinical core and elective skills	Outcomes
	Reported skills competency levels scored categories from A to D across various skills	Reported skills competency levels scored categories from A to D across various skills	Varying skills competencies reported across skills among registrars	Registrar skills competencies varied across clinical skills		

	4/6 first-year registrars did not complete the logbook skills	Logbook skills section were incomplete among year 1 registrars	Incomplete logbook skills among year one registrars	Poor completion rate among year 1 registrars	Poor completion rate among all three training years	Outcomes
	Incomplete entries in logbook skills in both second and third years	Incomplete entries in logbook skills in both second and third years	Incomplete logbook skills entries in second and third years among many skills	Incomplete logbook skills entries in second and third years among many skills		
	Third-year registrars recorded more category D scores than year1 and 2 registrars	Better competency levels recorded among third year registrars	Better skill competency levels among third year registrars	Better skill competency levels among third year registrars	Better skill competency levels among third year registrars	
	More category D scores were reported in adult medicine, women's health, child health, and emergency care skills	Self-reported higher competency levels in adult medicine, women's health, child health, and emergency care skills	Higher competencies in adult medicine, women's health, child health, and emergency care domain skills among registrars	Higher competencies in adult medicine, women's health, child health, and emergency care domain skills among registrars	Registrar reported higher competencies in women's health, child health, and emergency care than orthopaedics, ENT and anaesthesia domains	Outcomes
	Less category D scores in ENT, eyes and skin, orthopaedics, and anaesthetic skills	Self-reported competence were lower in ENT, eyes and skin, orthopaedics, and anaesthetic skills	Self-reported competence were lower in ENT, eyes and skin, orthopaedics, and anaesthetic skills	Self-reported competence were lower in ENT, eyes and skin, orthopaedics, and anaesthetic skills	Higher competency levels in all FM domain-specific skills in all three years	
	Scored category D scores in all Family Medicine domain-specific skills even in the first year	Scored category D in all Family Medicine domain-specific skills even in the first year	Higher skills competency levels were reported in all FM domain-specific skills	Registrars reported higher competency levels in all FM domain-specific skills in all three years		Outcomes
	Third years reported skills categories included A, B and C on some core skills	Third year self-reported lower score categories (A, B and C) on some core skills	Third year registrars reported competencies were low on some core skills	Third year registrars reported competencies were low on some core skills	Third year registrars reported skills competencies were low on some core skills	Outcomes
Total skill set scores medians in 14 FM domains						
	Total skill set score medians progressed in most domains across training years	Total skill set score medians progressed in most domains across training years	Score median progression was evident in all skill sets across training years	Score median progression was evident in all skill sets across training years	Score progression was evident in all skill sets across training years	
	Higher total skills score medians in adult medicine, women's health, emergency care	Higher total skills score medians in adult medicine, women's health, emergency care and child health in all three years	Total skill set score median were higher in adult medicine, women's health, emergency care and	Total skill set score median were higher in adult medicine, women's health, emergency care and child health	Total skill set scores were higher in adult medicine, women's health, emergency care and child health than orthopedics, ENT and	Outcomes

	and child health in all three years		child health domains in all three years	domains in all three years	anesathetics domains across all three years	
	Lower score median in orthopaedics, anaesthetics, palliative care, and ENT, eyes, and skin in all three years	Lower score median in orthopaedics, anaesthetics, palliative care, and ENT, eyes, and skin in all three years	Lower scores in orthopaedics, anaesthetics, palliative care, and ENT, eyes, and skin in all three years	Total skill set scores were lower in adult medicine, orthopaedics, anaesthetics, palliative care, and ENT, eyes, and skin domains in all three years		Outcomes
	Total skills set score median was higher in year two than year three registrars in COPC and teaching and learning domains	Total skills set score median was higher in year two than year three registrars in COPC and teaching and learning domains	Skills set competencies were higher in year two than year three registrars in COPC and teaching and learning domains	Skills set competencies were higher in year two than year three registrars in COPC and teaching and learning domains	Second year registrars scored higher skills set competency levels in COPC and teaching and learning domains	Outcomes
	Total elective skills set score median was the lowest in all three years	Total elective skills set score median was the lowest in all three years	Elective skill set score competencies remained low in all three years	Elective skill set score competencies remained low in all three years	Elective skill set competencies remained low in all three years	Outcomes
Assessment of learning						
University exams	6/12 registrars passed university exams in their first attempt	Half of the registrars passed university exams in first attempt	Only half of the registrars passed university exams in first attempt	Only half of the registrars passed university exams in their first attempt	Better pass rate for registrars in college exams than university exams	Outcomes
	5/12 of them failed in the 18-month exams, and 1/12 did not take the exams					
College exams						
	4/6 registrars who wrote college exams passed in their attempt	All registrars who wrote passed college exams in their first attempt	All registrars who took college exams passed in their first attempt	All registrars who took college exams passed in their first attempt		Outcomes
	2/6 did not take the college exams					

Table 3: Integration of qualitative results (Resources, Postgraduate supervision and Work based learning opportunities)

Subthemes	Themes	Synthesised categories	Synthesised themes	Components of logic model
Limited FP posts impact training	Impact of resource constraints	Family physician shortages	Lack of resources	Inputs
Equipment and infrastructure shortages	Impact of resource constraints	Lack of equipment and infrastructure	Lack of resources	Inputs
Internet connectivity needs to be improved	Impact of resource constraints	Internet access challenges	Lack of resources	Inputs
Funding shortages limit district training	Impact of resource constraints	lack of funding	Lack of resources	Inputs
Insufficient resources hinder training	The training environment is challenging	Shortages of material resources	Lack of resources	Inputs
Trainers need more support from peers and seniors	Family physicians need additional support to optimise their training role	Lack of peer support	Faculty support	Inputs
Trainers need support from district management	Family physicians need additional support to optimise their training role	Lack of district management support	Faculty support	Inputs
Trainers need more support from the university	Family physicians need additional support to optimise their training role	Lack of university support	Faculty support	Inputs
District management and university support is essential	Contextual influences on learning opportunities	Lack of registrar support	Faculty support	Inputs
Variable resources impede learning	Contextual influences on learning opportunities	Shortages of material resources	Lack of resources	Inputs
Trainers knowledge is variable	Family physicians skills and knowledge could be improved	Variable knowledge	Supervisor attributes	Processes (supervision)
Trainers have variable clinical skills	Family physicians skills and knowledge could be improved	Variable clinical skills	Supervisor attributes	Processes (supervision)
Trainers display variable interpersonal skills	Family physicians skills and knowledge could be improved	Variable interpersonal skills	Supervisor attributes	Processes (supervision)
Supervisor characteristics impact the training	The nature of engagement matters	Good supervisor characteristics	Supervisor attributes	Processes (supervision)
FP supervision in the clinical context enables individual attention	Supervision is context-specific and supervisor dependent	One-on one FP engagement	Supervision characteristics	Processes (supervision)
FP supervision in the non-clinical context provides multiple perspectives	Supervision is context-specific and supervisor dependent	Multiple FP engagments at regional training centres	Supervision characteristics	Processes (supervision)
Non-FP supervision focuses only on the clinical training	Supervision is context-specific and supervisor dependent	Clinical engagment by non-FPs	Supervision characteristics	Processes (supervision)
Engagement is tailored to learning needs	The nature of engagement matters	Engage on registrar learning needs	Supervision characteristics	Processes (supervision)

Registrars often feel unsupervised	Supervision is not ideal	Lack of supervision	Supervision characteristics	Processes (supervision)
Patients	Learning from interpersonal interactions	Learn from patient engagements	Interactive learing	Processes (registrar learning)
Peers	Learning from interpersonal interactions	Peer learning	Interactive learing	Processes (registrar learning)
Family Physicians	Learning from interpersonal interactions	Supervisor interactions	Interactive learing	Processes (registrar learning)
Other professionals	Learning from interpersonal interactions	Interprofessional learning	Interactive learing	Processes (registrar learning)
Students and staff teaching	Learning from district activities	Training staff and students	Engagement in district activites	Processes (registrar learning)
Attending CME meetings	Learning from district activities	Involve in CME	Engagement in district activites	Processes (registrar learning)
Attend district, M&M and management meetings	Learning from district activities	Partcipate in district meetings	Engagement in district activites	Processes (registrar learning)
Professionalism affects engagement	The nature of engagement matters	Lack of professionalism	Registrar characteristics	Processes (registrar learning)
self-learning strategies	Self- directed learning	Self directed learning	Registrar characteristics	Processes (registrar learning)
Learning portfolios	Self- directed learning	Learning portfolios not utilsed well	Registrar characteristics	Processes (registrar learning)
Feedback	Self- directed learning	Variable feedback engagement	Registrar characteristics	Processes (registrar learning)
Reflection	Self- directed learning	Inadequate reflection	Registrar characteristics	Processes (registrar learning)
Disparities in resource allocation	Impact of resource constraints	Resource standardisation	Need standardisation	Contextual factors
Supervision is not standardised across the training sites	Supervision is not ideal	Standardise supervison	Need standardisation	Contextual factors
District learning opportunities needs to be standardised	Contextual influences on learning opportunities	Standardise learning opportnities	Need standardisation	Contextual factors
Work-life balance is challenging for registrars	The training environment is challenging	Work-life balance challenges	Learning environment is not conducive	Contextual factors
The district hospitals are perceived as hostile	The training environment is challenging	More district hospital support	Learning environment is not conducive	Contextual factors
Training across different facilities promotes learning	Contextual influences on learning opportunities	Learning depends on health facilities	Learning environment is not conducive	Contextual factors
Time constraints among FPs	Supervision is not ideal	Time constraints	Learning environment is not conducive	Contextual factors
Excessive workload	Contextual influences on learning opportunities	Workload challenges	Learning environment is not conducive	Contextual factors

Table 4: Final integration matrix qualitative results after data consolidation

INTEGRATED MATRIX QUALITATIVE RESULTS				
Sub-themes	**Themes**	**Synthesised categories**	**Synthesised themes**	**Components of logic model**
Limited FP posts impact training	Impact of resource constraints	Family physician shortages	Lack of resources	Inputs
Equipment and infrastructure shortages		Lack of equipment and infrastructure		Inputs
Internet connectivity needs to be improved		Internet access challenges		Inputs
Funding shortages limit district training		Lack of funding opportunities		Inputs
Variable resources impede learning	Contextual influences on learning opportunities	Equipment and FP shortages		Inputs
Insufficient resources hinder training	The training environment is challenging	Lack of FPs, equipment and infrastructure		Inputs
The district hospitals are perceived as hostile		Lack of district hospital staff support	Faculty support	Inputs
District management and university support is essential	Contextual influences on learning opportunities	Lack of registrar training support		Inputs
Trainers need more support from peers and seniors	Family physicians need additional support to optimise their training role	Lack of peer support		Inputs
Trainers need support from district management		Lack of district management support		Inputs
Trainers need more support from the university		Lack of university support		Inputs
Trainers knowledge is variable	Family physicians skills and knowledge could be improved	Variable knowledge	Supervisor attributes	Processes (Supervision)
Trainers have variable clinical skills		Variable clinical skills		Processes (Supervision)
Trainers display variable interpersonal skills		Variable interpersonal skills		Processes (Supervision)
Supervisor characteristics impact the training	The nature of engagement matters	Good clinical supervisor characteristics		Processes (Supervision)
FP supervision in the clinical context enables individual attention	Supervision is context-specific and supervisor dependent	One-on one FP engagement	Supervision characteristics	Processes (Supervision)
FP supervision in the non-clinical context provides multiple perspectives		Multiple FP engagements at regional training centres		Processes (Supervision)
Non-FP supervision focuses only on the clinical training		Clinical engagment by non-FPs		Processes (Supervision)
Engagement is tailored to learning needs	The nature of engagement matters	Engage on registrar learning needs		Processes (Supervision)

Registrars often feel unsupervised	Supervision is not ideal	Lack of supervision		Processes (Supervision)
Patients	Learning from interpersonal interactions	Learn from patients	Learning from interpersonal interactions	Processes (Registrar learning)
Peers		Peer learning		Processes (Registrar learning)
Family Physicians		Supervisor interactions		Processes (Registrar learning)
Other professionals		Interprofessional learning		Processes (Registrar learning)
Students and staff teaching	Learning from district activities	Training staff and students	Learning from district activites	Processes (Registrar learning)
Attending CME meetings		Attending CME meetings		Processes (Registrar learning)
Attend district, M&M and management meetings		Partcipate in district meetings		Processes (Registrar learning)
Professionalism affects engagement	The nature of engagement matters	Lack of professionalism	Registrar characteristics	Processes (Registrar learning)
self-learning strategies	Self- directed learning	Self directed learning		Processes (Registrar learning)
Learning portfolios		Learning portfolios		Processes (Registrar learning)
Feedback		Feedback engagement		Processes (Registrar learning)
Reflection		Reflection		Processes (Registrar learning)
Disparities in resource allocation	Impact of resource constraints	Resource standardisation	Standardisation across districts	Contextual factors
Supervision is not standardised across the training sites	Supervision is not ideal	Standardise supervision		Contextual factors
District learning opportunities needs to be standardised	Contextual influences on learning opportunities	Standardise learning opporutnities		Contextual factors
Work-life balance is challenging for registrars	The training environment is challenging	Work-life balance	Conducive learning environment is essential	Contextual factors
Training across different facilities promotes learning	Contextual influences on learning opportunities	Training across different facilities		Contextual factors
Time constraints among FPs	Supervision is not ideal	Time constraints		Contextual factors
Excessive workload	Contextual influences on learning opportunities	Workload		Contextual factors

Table 5: Final data Integration from Chapters 4 to 8 (Quantitative and Qualitative results)

Synthesised categories	**Synthesised themes**	**Components of logic model**	**Synthesised categories**	**Synthesised themes**	Components of logic model
Family physician shortages	Lack of resources	Inputs	Inadequate feedback characteristics in learning plans and mini-CEX forms	Inadequate feedback characteristics	Output
Lack of equipment and infrastructure		Inputs	Non-FPs supervised learning plans	Variable supervison	Output
Internet access challenges		Inputs	FP feedback focused more on hard than soft skills in learning plans and mini-CEX forms	Inadequate feedback characteristics	Output
Lack of funding opportunities		Inputs	More FP feedback in mini-CEX forms than learning plans	Variable extent of feedback	Output
Equipment and FP shortages		Inputs	Non-FP supervisors provided more comprehensive feedback	Variable extent of feedback	Output
Lack of FPs, equipment and infrastructure		Inputs	More feedback on soft skills from non-FP supervisors	Variable extent of feedback	Output
Lack of district hospital staff support	Faculty support	Inputs	Lenient scoring by all supervisors	Lenient Scoring by supervisors	Output
Lack of registrar training support		Inputs	Same FP conducted all mini-CEX assessments (AfL) in some districts	Variable supervision	Output
Lack of peer support		Inputs	Score progression (global and total) was evident across training years in learning plans and mini-CEX forms	Score progression was evident between training years	Output
Lack of district management support		Inputs	Feedback provided in mini-CEX was dependent on training district but not on year of training	Feeback was context dependent but not on training year	Output
Lack of university support		Inputs	Feedback provided in learning plans not dependent on training district or year of training	Feeback was context dependent but not on training year	Output
Variable knowledge	Supervisor attributes	Processes (Supervision)	Registrars scored variably across LP and QA scores	Scores varied widely across LP and QAs	Outcomes
Variable clinical skills		Processes (Supervision)	Score progression was evident in LP, but not in QA scores across training years		Outcomes
Variable interpersonal skills		Processes (Supervision)	Registrar scores varied widely in LP not in QA across the training distrcits		Outcomes
Good clinical supervisor characteristics		Processes (Supervision)	Registrar skills competency levels varied widely across clinical core and elective skills	Skills competency levels varied widely across clinical core and elective skills	Outcomes
One-on one FP engagement	Supervision characteristics	Processes (Supervision)	Poor completion rate among all three training years	Poor completion of self-reported skill competence levels across all years	Outcomes

Multiple FP engagments at regional training centres		Processes (Supervision)	Incomplete logbook skills entries in secon and third years among many skills		Outcomes
Clinical engagment by non-FPs		Processes (Supervision)	Better skill competency levels among third year registrars	Third year registrars reported higher skills competence levels	Outcomes
Engage on registrar learning needs		Processes (Supervision)	Registrar reported higher competencies in women's health, child health, and emergency care than orthopaedics, ENT and anaesthesia domains	Skill competencies varied widely among family medicine domains across training years	Outcomes
Lack of supervision		Processes (Supervision)	Higher competency levels in all FM domain-specific skills in all three years		Outcomes
Learn from patients	Learning from interpersonal interactions	Processes (Registrar learning)	Third year registrars' skills competencies were low on some core skills		Outcomes
Peer learning		Processes (Registrar learning)	Score progression was evident in all skill sets across training years	Score progression was evident in all skill sets across training years	Outcomes
Supervisor interactions		Processes (Registrar learning)	Total skill set scores were higher in adult medicine, women's health, emergency care and child health than orthopaedics, ENT and anaesthetics domains across all three years	Total skills set scores in all domains varied widely across training years	Outcomes
Interprofessional learning		Processes (Registrar learning)	Second year registrars scored higher skills set competency levels in COPC and teaching and learning domains		Outcomes
Training staff and students	Learning from district activites	Processes (Registrar learning)	Elective skill set competencies remained low in all three years		Outcomes
Attending CME meetings		Processes (Registrar learning)	Only half of the registrars passed university exams in their first attempt	Registrar better pass rate in college examinations than university examinations	Outcomes
Partcipate in district meetings		Processes (Registrar learning)	All registrars who took college exams passed in their first attempt		Outcomes
Lack of professionalism	Registrar characteristics	Processes (Registrar learning)			
Self directed learning		Processes (Registrar learning)			
Learning portfolios		Processes (Registrar learning)			
Feedback engagement		Processes (Registrar learning)			
Reflection		Processes (Registrar learning)			

Resource standardisation	Standardisation across districts	Contextual factors
Standardise supervision		Contextual factors
Standardise learning opporutnities		Contextual factors
Work-life balance	Conducive learning environment is essential	Contextual factors
Training across different facilities		Contextual factors
Time constraints		Contextual factors
Workload		Contextual factors

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