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# TRAINING NON-PHYSICIAN ANAESTHETISTS IN SUB-SAHARAN AFRICA: A QUALITATIVE INVESTIGATION OF PROVIDERS' PERSPECTIVES

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## ABSTRACT

**Objectives** To explore the views of non-physician anaesthesia providers (NPAPs) and their colleagues regarding the effectiveness of NPAP training programmes in three contrasting sub-Saharan African countries.

**Design** This was a qualitative exploratory descriptive study. Semi-structured interviews were conducted online, recorded, transcribed and analysed thematically using NVivo.

**Setting** Participants' homes or workplaces in Sierra Leone, Somaliland and Uganda.

**Participants** 15 NPAPs, physician anaesthetists and surgeons working in the countries concerned.

**Results** Three major themes were identified: 1) discrepancy between urban training and rural practice, 2) prominent development of attitudes outside the curricular set during training, including approaches to learning and clinical responsibility and 3) the importance of inter-professional relationships developed during training for later practice.

**Conclusions** Anaesthesia providers in different cadres and very different country contexts in sub-Saharan Africa describe common themes in training which appear to be significant for their later practice. Not all these issues are explicitly planned for in current training programmes, although they are important in the view of providers. Subsequent programme development should consider these themes with a view to enhancing the safety and quality of anaesthesia practice in this context.

**Keywords:** Anaesthetics; Medical Education and Training, Qualitative Research, Surgery**;** International health services.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- In-depth interview approach complements previous quantitative approaches to describing NPAP training.
- Online interviewing enabled greater reach to more remote participants.
- Rigour enhanced through analytical team approach
- Transferability to other settings in sub-Saharan Africa is likely to be limited, given the variation in health systems and institutions within the large region.
- Conducting the interviews in English may have limited the fluency and/or comprehension of participants.

## INTRODUCTION

A deficit of anaesthesia providers limits the availability of safe surgical care in sub-Saharan Africa (SSA).[1] Though there are multiple reasons for the deficit, inadequate training of providers is an important part of the problem.[2] Recent work which has demonstrated an overall shortfall in the anaesthesia workforce (physician and non-physician) in many low- and middle-income countries (LMICs) has also shown the relative importance of non-physician anaesthesia providers (NPAPs) for the majority of anaesthesia delivery in many of the same countries.[3] Thus recent calls for an increased focus on training quality[4] and training expansion within a task-sharing framework,[5,6] relate to non-physician as well as to physician anaesthesia providers.

Nonetheless, relatively little work so far has described the characteristics of current NPAP training models with a view to further development. Notable exceptions include a few narrative accounts of specific programmes which provide insight into their designed or intended structure and curricula,[7-9] and surveys of graduates which employed a quantitative approach to describe the efficacy of training in Ghana[10] and Sierra Leone.[11] Qualitative research in the field is even more scarce[12,13] although the potential of this approach has been recognised[4] and may be particularly valuable in capturing unintended and latent outcomes of training.[14]

This study therefore employed an interview-based, qualitative approach to explore the views of qualified NPAPs and those who work closely with them professionally, about how well NPAP training programmes prepare NPAPs for practice. It is hoped that this will complement the existing literature, and inform the development of existing and new NPAP training programmes. The study involved participants from three different countries in SSA; the key features of the anaesthesia workforce and training structures in each country are now described.

## Country contexts

*Sierra Leone*

Sierra Leone (population: approx. 7.5 million)[15] has experienced particular challenges to its health system as a result of the civil war (1991-2002) and the recent Ebola outbreak (2014-2015); the latter in particular focused international attention on health system strengthening and workforce development.[16,17] Sierra Leone has a very small number of PAs, all based in Freetown. Nurse anaesthetists (NAs) form the principal cadre of trained anaesthetic provider and have been trained in Sierra Leone since 2002, initially through an MSF-supported programme delivered by a visiting PA and more recently through a similarly structured programme delivered by local PAs, supported intermittently by international visitors and funded by the United Nations Fund for Population Activities.[11] The NA programme lasts 18 months and is based in Freetown, where most training is delivered (with the exception of short periods in provincial hospitals). In 2014 an additional training programme started for a new cadre of assistant providers, anaesthetic technicians. Approximately 130 NPAPs are thought to work in the country.[4]

*Somaliland*

In common with Sierra Leone, Somaliland has experienced enormous challenges to its health system as a result of regional insecurity. Its unusual position as an unrecognised state limits support from major international actors as well as its scope for ongoing economic development.[18] Training for anaesthetists (from nursing, midwifery or pharmacy backgrounds) has been delivered in a formal 18-month programme in two cities, Hargeisa (since 2013) and Boroma (since 2011), supported and delivered in Somaliland by Kenyan Registered Nurse Anaesthetists and a PA based in Kenya. A previous single cohort of health officers (from a nursing background) were trained in 2006, supported by the Kings-THET-Somaliland Partnership,[19] but the majority of anaesthesia in Somaliland is still thought to be delivered by 'technicals', providers with limited or no training. No PAs are working

clinically in the country on a long-term basis. 31 NPAPs were practising in the country at the time of data collection, serving a population of around 4 million people.[20]

*Uganda*

The majority of anaesthesia providers in Uganda are anaesthetic officers (AOs) who complete a four-semester diploma in anaesthesia, most commonly having a previous clinical officer qualification (although registered nurses, midwives and anaesthetic assistants may also undertake training). AO training in this format started in 1985, overseen by the Uganda Institute of Allied Health and Management Sciences. Until recently most training was delivered in Kampala with brief placements in district hospitals, but recent expansion has meant that several additional regional centres now also provide AO training programmes. Training is organised and delivered by senior AO tutors although physicians are also variably involved in theatre-based supervision and theoretical teaching. A new degree course for non-physician anaesthesia providers started in 2017. Currently it is estimated that there are around 540 AOs in Uganda and there has also been a rapid expansion in PA numbers over the last decade, as international bodies have supported post-graduate training in anaesthesia for physicians.[21] Thus of the three countries, Uganda has the most well established NPAP training and also the greatest number of PAs, serving a population of around 43 million.[22]

## METHODS

Ethical approval was sought and obtained for this study from the King's College London Research Ethics Committee (ref. LRU-16/17-3981), the Uganda National Council for Science and Technology (ref. HS30ES) and the Office of the Sierra Leone Ethics and Scientific Review Committee (no reference provided). Informed consent was obtained from all participants.

### Study design

In this qualitative study, in-depth interviews with clinical providers were conducted and analysed to explore their views on NPAP training programme effectiveness. The theoretical framework of the study was informed by Boone's evaluative model[14] and situated within a critical realist paradigm. Thematic analysis was consistent with Ormston's account of balance between deductive and inductive elements:[23] existing research and experience inevitably influenced the study design and early subtopic identification, but data collection and analysis were focused on information arising directly from interviewees, allowing space for new topics and themes to emerge which could then in turn be related back to existing knowledge. A position of 'empathic neutrality' was adopted, acknowledging that the identity of the researcher shapes the process of data collection, analysis and interpretation:[23] these issues are considered further in the discussion.

### Sampling

Three countries were selected for study based on their differing anaesthesia workforce makeup: Uganda, Sierra Leone and Somaliland. Clinical providers from three professional groups were recruited in each country: NPAPs from any cadre, physician anaesthetists (PAs) and surgeons. The latter two groups, as those who work closely with NPAPs, were felt to offer an additional valuable perspective on NPAP training. A purposive approach was used to ensure that at least one respondent from each professional group was included from each country, with the exception of Somaliland where no PAs were practising at the time of the study. Initial identification of potential respondents took place through networks known to the researchers and subsequently by 'snowballing' via existing respondents. Between nine and fifteen interviews were planned to allow sampling across all

professional groups in all countries. Respondents were approached digitally (email or online messenger) and provided with written information in advance. Consent was confirmed and recorded prior to the start of the interviews.

**Data collection**

Following pilot interviewing in the UK, all study interviews were conducted synchronously online using VoIP software (Skype or WhatsApp) by one interviewer (HE), in English, using an interview guide (online supplementary material), and audio recorded using "Call Recorder" (a Skype plugin) and/or "Audio Recorder" (an Android phone app); field notes were made contemporaneously. No interviews were repeated and no non-participants were present during interviews. Following interviews, all audio recordings were anonymised and transcribed by the interviewer. Participants were offered the opportunity to check and comment on their transcripts: two did so, one of whom responded with a single minor correction which was amended before analysis. Median interview duration was 46 minutes.

**Data analysis**

An iterative approach was undertaken using NVivo software to elicit and refine themes emerging from the data: initial open coding was used alongside field notes and analytic memos written during the coding process to generate a thematic framework within which further linkages and concepts could be understood.[24] All data was then coded independently by two other team members after which findings were discussed among the team for consistency and agreement on emergent themes (see online supplementary material). Alternate data sources (academic and grey literature) were used as an additional triangulation strategy to further develop understanding of the interview data.

**Patient and public involvement**

Patients and public were not directly involved in research design, recruitment or conduct of this study.

## RESULTS

In total 25 potential respondents were approached of whom 15 consented to be interviewed. A summary of recruitment is provided in the online supplementary material. Three major themes emerged in relation to the way in which NPAP training programmes prepared NPAPs for practice.

### Theme 1: Urban training for rural practice

Common to all three countries is discrepancy between the predominantly urban location of training and subsequent work in more rural settings. Resource differences relate not only to equipment and drug availability but also to the availability of support and supervision. These differences are recognised by providers and trainers, and attempts are made to mitigate them.

The majority of training has been delivered in city hospitals which can provide adequate caseload and resourcing to support the students. However, many newly qualified NPAPs are allocated or deployed back to sponsoring hospitals to work, which may be distant from their training centre and considerably more limited or less consistent in terms of resources. Consequently, in some cases, NPAPs' training programmes have not equipped them to deal with their new working conditions, including lack of equipment, infrastructure, drugs and supporting personnel.

Such urban-rural differences were recognised by respondents in all settings and some efforts to address this problem were described: in Sierra Leone, students are explicitly encouraged during training to relate their urban experience to their rural practice, developing approaches and adaptability which they will need in future work.

*"Oftentimes, when they [students] do go out there, they come back and they say, well yes, but you told us this, but now we are out in the field, we're seeing something*

*different... And you know, out in this part of the world, theory is one thing, but when they go out they find they have to adapt quite a lot. Because we train them with the hope that they will have all the equipment and consumables they need, but oftentimes it's unavailable. So you know... we try to bring this out in the classroom to say well, fine, if this is not available, so this is your plan B, this is your plan C, kind of thing." [SL1]*

In Uganda, where NPAP training is now offered in towns outside the capital, the need for training in 'rural' techniques including the use of ether anaesthesia is recognised.

*"Some hospitals are still using ether [...] In [city] they do not know ether [...] But we [district hospital] teach them about ether, so that when they go back, the only thing they have got, ether, they know." [U2]*

However, the difficulties of those who train in a centre with adequate facilities and move to one without are still considerable and include professional frustration, a sense of isolation and skill attrition.

*"From the place of training, the facilities are good. Go back to your district hospital, you don't see. From a place of training, some drugs are there. Going back to your workplace, your hospital of work, it is not there [...] all the equipment and drugs he used during the course of training is not there. So as one goes back there, he lose the skills [...] - if you visit that person after five years, from training, you'll find that he's a different person from the person he was at school." [U2]*

In Somaliland, this finding was least marked, perhaps because the majority of the trained nurse anaesthetists continue to practise in cities, with a minority moving away to more remote areas. Nonetheless, the mismatch in resourcing between urban and rural settings is large.

*"[in contrast to the participant's city]...in some places they don't have any oxygen or any anaesthesia machine which have a ventilator [...] they don't have endotracheal tubes [...] they don't have most of drugs, even" [S6]*

**Theme 2: Attitudes outside the curricular set**

A striking feature of interviews with all respondents, when they reflected on how their training had prepared them for practice, was the focus on non-technical matters. While all acknowledged explicit curricular components of training (theory and practical, including skills such as intubation), they also considered how they had developed personally and professionally during training, and the influence of that development on their clinical practice. 'Soft' skills and attitudes such as self-directed learning, decision-making, communication and developing clinical responsibility were frequently mentioned. Two particular aspects of this theme are examined in more detail here: learning and clinical responsibility.

Learning

The learning experience of NPAPs during their training was marked by high levels of enthusiasm and motivation, as well as by some difficulties. NPAPs described their motivation for training principally in terms of personal interest or community loyalty (both of which appeared to persist into their working practice), and related their learning explicitly to these motivations. They described the active pursuit of learning opportunities during training, seeking out enthusiastic trainers, taking opportunities to practise procedures or favouring work at times when fewer trainees were around to compete for practical experience.

*"When I learn how to do spinal anaesthesia and general anaesthesia, I was very excited! I go home, I used to think about the patients we done and think about the patients we are going to do… all the time! [...] I take the chance to learn for the*

*anaesthesia. Uh-huh. When I was working, I was learning. I wasn't taking ever a day off." [S4]*

*"It's easier to learn at night. Much better, I mean, that's according to me, because there is no big competition. We are many students… so when you go during the day you are over ten people, and all of you want to intubate, all of you want to give a spinal. So I found it, I find [laughs] I found it easier to learn in the night." [U3]*

Learning during training was not always straightforward. Grappling with new theoretical concepts, difficulties accessing learning opportunities (because of insufficient caseload, or too many competing learners), unmotivated trainers or conflicts with other providers all made learning more difficult. Such problems were not glossed over in NPAPs' recollections of their training experience, but despite this, the overall commitment to and hunger for learning by trainees dominated providers' recall of their training.

*"And they really, really, want to learn. Really. They have a deep desire to learn, whatever it is that I will say during my course of time with them, as simple as it may be to me, to them they really value it." [U6]*

*"In textbook I follow the anaesthesia… pages. So when I see a new thing or new book, I try to read, try to gain knowledge. But it can't give the practicals. [….] Sometimes they talk about something I never heard. And you know that I try to Google and learn how, you know." [S4]*

Motivation to learn, the capacity to do so and the necessity of seizing learning opportunities when they arise is expressed and developed in training; a highly self-directed approach to learning in their subsequent practice was typical of the NPAPs interviewed. Although acquiring this approach might not have been officially considered to be part of their formal training it was prominent in providers' recall of their training experience.

Responsibility

The development of clinical responsibility in training prepares NPAPs in part for the responsibility they will bear in practice, and was viewed by NPAPs both in a general sense (recognition of the 'life and death' nature of the job, the need for anaesthesia in improving health outcomes in the community) and in a specific sense, in terms of personal accountability for individual actions or inactions.

Several factors external to the student confer increasing levels of responsibility on them, such as levels of supervision (from immediate to distant), case allocation and acquisition of additional roles, as senior students start to supervise more junior colleagues (particularly commented on from Somaliland participants). The formality of these external structures varies:

*"We do have guidelines which were there - we're lucky that we had somebody who basically started the department a few years ago, I think immediately she saw that there was going to be…a problem so she came up with those guidelines. Some of them are like, you know, paediatrics less than six, ASA3 and above, uh, several things of that nature. So they don't touch until they call, so there is a small booklet which you follow, and, er, for there,* ***in other places*** *it is just word of mouth, people know that they do this and do that. So that's how it is, yeah." [U5]*

The sense of external factors conferring responsibility was balanced by key 'internal moments', which NPAPs identified on reflection on their own training. All were expressed in terms of recognising their responsibility for life and death, and were associated with specific cases:

*[first intubation] "It was the first time that I have to come in contact with a human being, and I know if I failed, it might be the end of the patient's life." [SL3]*

*"I remember, there is a boy, who was playing with a bomb - he didn't know it is a bomb or not, then it explode. He came here about 7.30pm. Then I saw him. He - his stomach was sitting beside him, and he's just - he wasn't crying. I thought, oh! What are we doing? We have to hurry, we have to do this case. Then we run. We* ***take responsibility****, we did that case. And we successfully done that case and he was… twelve years old… It was scary. Uh… uh… he was talking and he was hurting, but I was thinking that we can save this boy. Yeah.* ***If we do the right things****, we can save him." [S4]*

Responsibility to challenge decisions was also highlighted, for example by this student who was being instructed to give a dangerous anaesthetic by a misinformed colleague:

*"Then he tell me, this is ketamine with atropine. Whole of bottle? Yes, whole of bottle! With atropine. So push it.* ***Then I say I will not*** *push for this one. Because I am not going to kill this patient…." [S1]*

The issue of responsibility is explicit in training for some students in Somaliland; not only must the student recognise their clinical responsibility, but the trainer is responsible to make sure they understand it:

*"My teacher teach me, so when I teach them to do the right things with the priority, so if they do wrong, or if they don't do the right things,* ***you have to tell them****. For the good, to do good, this is life, you can't lose a life [...] if you push the wrong medication, […] we can lose a life." [S4]*

Although NPAP students undertake considerable clinical responsibility during training, the transition to working practice still involved a step up. Some, but not all, programmes and hospitals put formal supervision in place for newly qualified providers, which eased transition. Those working in the same hospital where they trained, or with other providers present, found the transition fairly straightforward:

*"I don't meet any problem. because there is a, some in anaesthesia before working me here, they support me, they give me support." [S5]*

*"We don't have problems, we, we - yeah, we work as a team." [S3]*

Others, who worked alone, described a sense of isolation when they started their first job compared with their training experience: the need for them to work autonomously, to make decisions and speak up for themselves (and their patients), resulted in considerable strain.

*"This was like, from crawling to standing, all of a sudden, it - it was a very challenging moment… it was very challenging because I had to be in theatre […] Whatever happens, or whatever doesn't happen, it's all about me. So it was a very challenging moment, a very challenging time, I remember the very first days, uh, I'd leave theatre with a headache because I'd freak out on almost everything, much as I came in, uh, thinking OK, now I can stand on my own, but it was different. Yeah." [U3]*

**Theme 3: Inter-professional relationships developed during training have implications for later practice.**

This theme exposes the greatest difference between the three countries studied, as a result of the different cadres of anaesthesia provider present in each. Common to all three countries was the influence of relationships developed during training on subsequent practice, in regard to both inter-cadre conflict and help-seeking for clinical situations.

In Uganda, NPAPs may work in theatre during their training with both PAs in training and medical students, although their own programme is directed by senior anaesthetic officers. This common space provided opportunities for positive interactions between cadres (role modelling, training) as well as negative

interactions (competition for training opportunities, a sense of territorialism). The value of individual relationship building during training years to counter an inherited culture of opposition and suspicion, was highlighted by respondents in Uganda to a greater degree than in Somaliland or Sierra Leone.

*"So when you join the AO training culture, you will find a certain guy who'll say, I've had a bad experience with this anaesthesiologist, I've had a bad experience with this one, I've had a bad experience with this one… If you're really not that strong, you will keep thinking, OK, I might really have a bad experience with this one.*
*And then some hospitals where AOs are actually getting the chance to work with them, they are putting that hearsay behind… actually they are human beings, they are fine [….]. We may need her help, we can ask her help, she comes and helps. When she needs help, she comes and asks. But when, there are people in the school, when they've never actually interacted with an anaesthesiologist, or maybe they never even met in the same room, they fear that those people are not good." [U3]*

One physician also reflected on how the experience of training NPAPs helped develop his view of the cadre, influencing his subsequent relationship with individuals.

*"You just want them to talk. When you listen to their stories it's just humbling. Really humbling [...] They've saved more lives individually than all of us combined I think. I mean, they are truly unsung heroes." [U6]*

In all three countries, the relationships built during NPAPs' training programmes directly influenced subsequent help-seeking by practitioners. Four categories were apparent within this theme: case allocation and sharing of workload (where more than one provider is on the same site), referral of patients to another centre, advice-seeking, and supervision. Explicit criteria existed for case-allocation and referral in some but not all centres, however advice-seeking and supervision were mostly dependent on who the initiator of the interaction knew, and on their in-training

experience. Many transactions thus occurred between an NPAP and their previous trainer (of whichever cadre).

*"When we have difficulties, we usually call our instructor, that is a physician anaesthetist in [city]" [SL3]*

*"I remember one case that was a very difficult intubation because he had a burn contracture. We postponed that day, and we call one of our [old] teachers, he's in [neighbouring city]... then he come from [neighbouring city] and he help" [S3]*

*"I actually have a lot of contacts with many of them. Many of them still call me and they will still do cases together on phone and everything. But I think that that relationship comes from there - the moment they know that we don't know you, that's the end of it.... They just phone somebody they know." [U5]*

Thus, relationships developed in training are used for subsequent help-seeking in clinical practice, even across considerable geographic distance. Such 'task-sharing' interactions, although seldom explicitly described as such, occurred successfully but informally in all countries, largely in the absence of a formal task-sharing framework.

## DISCUSSION

The approach used for this study complements quantitative work in the same field:[4] the major themes identified have implications for the development and expansion of training and hence for the provision of safe anaesthesia.

Urban-rural inequity, well recognised in healthcare provision more broadly[25,26] has implications for the efficacy of training. If newly qualified anaesthesia providers meet situations and resources for which they have not been trained, problems with safety and quality of anaesthesia provision follow in the short term. In the long term, discouragement and problems with workforce retention can be anticipated. Ultimately, the aim must be to improve resource equity across all settings; however, in the interim, strategies such as those which are being developed in Sierra Leone and Uganda to increase the scope of training to encompass techniques and adaptations required in rural areas, the exposure of trainees to rural practice during their training, and the ongoing visits made by PAs in Sierra Leone to their ex-trainees in the districts, should be promoted and encouraged.

Attitudinal aspects of training are challenging to establish in curricula in any setting,[27,28] but the impact of what NPAP students learn in this respect on their future practice should not be underestimated. This generally highly motivated group of trainees have to work hard to complete their training successfully, and carry their enthusiasm and self-direction into their subsequent practice, expressing high levels of interest in opportunities for continuing professional development (CPD) and career development. Similarly, through example and experience, a sense of clinical responsibility towards individual patients and local or national communities is developed in training, manifest as an imperative to practise safely, deliver quality, communicate clearly and where necessary handle conflict. The importance of training experiences and role models for individuals' development as clinical professionals is consistent with work in other groups and settings.[29,30]

Finally, relationships formed in training, at individual levels in particular, are significant for subsequent inter-cadre interactions in all three countries in the relative absence of formal task-sharing systems at a national level. While recognising and systematising task-sharing as part of national workforce strategies is recommended,[6] attention should also be paid to the value of positive inter-cadre and trainer-trainee relationships at the early stages of training which can both reduce conflict[31] and enhance task-sharing in its current form.

**Limitations**

Limitations apply to this exploratory study. Firstly, data saturation (a complex concept)[32] was not formally used to define sample size because analysis was conducted after the completion of data collection. However, analysis of the final two interviews conducted did not reveal new themes, suggesting that data saturation was at least approached. Secondly, transferability is limited. Within SSA, countries and regions vary greatly with regard to their history, political, economic, cultural and healthcare systems. Although efforts were made to maximise the relevance of the findings within the region by selecting three countries disparate in their training models and PA:NPAP workforce balance, and by purposively sampling data from three different clinical groups (PAs, NPAPs and surgeons), in order to increase the diversity of situation and perspectives on the same question,[33] the breadth of contextual variation between countries in Africa means that the transferability of these findings to other countries on the continent must be limited at this early stage. Thirdly, although interviews were conducted in English, for some participants this was a second or even third language. This could have affected comprehension and fluency of the interview. Communication could also have been impaired because online interviews were conducted rather than face-to-face interviews. Synchronous online interviewing has some benefits in broadening the geographic remit of a study as well as putative advantages for interviewee comfort.[34] However rapport between interviewer and interviewee may be worse than in person, and non-verbal cues, especially visual ones, are more difficult or impossible to detect.[35]

Finally, issues of reflexivity must be considered. The position and person of the interviewer, and of the wider analysing team, are relevant.[23] The interviewer's identity as a British, white, female, consultant physician anaesthetist was known to all interviewees, and will have affected her assumptions, interactions with interviewees, and potentially interviewees' responses. Of the analytic team, four are based in the UK and one in Uganda. The UK team members have varying familiarity with one or more of the settings investigated, but all have experience in sub-Saharan Africa. All are physicians, which could have affected both their reading and understanding of the transcripts.

## Conclusion

Although training is by definition formative for practice (curricula are developed, placements are arranged, trainers train and assessments are held in order to prepare the trainee for a new role), training also affects practice in ways which have been less well recognised. This study used a qualitative approach to describe the experience of clinicians in sub-Saharan Africa with regard to NPAP training, finding that discrepancies between urban training and rural working, attitudinal development during training, and the importance of the relationships developed in training were important themes. These aspects of training warrant further investigation and should be specifically considered in the development and expansion of the NPAP workforce.

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**COMPETING INTERESTS**

None.

**CONTRIBUTORSHIP**

HE conceived and designed the study, completed data collection and analysis and drafted the paper for submission.

FB also contributed to the conception of the study, undertook data analysis and interpretation and critically revised the paper prior to submission.

LB, SKI and VT undertook data analysis and interpretation and critically revised the paper prior to submission.

**DATA SHARING**

Due to the commitment to preserve participants' anonymity and the small number and potential identifiability of participants, original interview recordings and transcripts cannot be made openly available.

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**SUPPLEMENTARY MATERIAL**

**Interview topic guide**

Preliminary information and checks:

- introductions and confirmation of interviewee's name
- recap purpose of the interview, optional nature, able to withdraw data
- confirm still willing to proceed as per consent form, timeframe
- confirm consents to be recorded

Opening questions:

- role/s and experience of the interviewee
- current and previous place/s of work, what is it like?
- local anaesthesia providers: who, how many, what training?
- what kind of experience / knowledge do they have about the wider situation in their country?

Training NPAPs:

- personal experience (NPAPs) or observation/involvement (others)
- what do they recall about training?
    - structure of their training
    - memorable events / experiences
    - content of training

The working practice of NPAs (with a view to then discussing the transition between training and working)

- either personal experience (NPAPs) or working with them (others)
- caseload and nature
- work outside the OR
- factors improving safety and quality of care, and barriers
- job satisfaction / dissatisfaction and reasons

Transition between training and working:

- recall the first day of work (if NPA)
- how well prepared were they? Did they have to adjust?
- what do they wish they knew then, that they know now?
- what is it like working with a newly qualified NPA (for non-NPAs)?

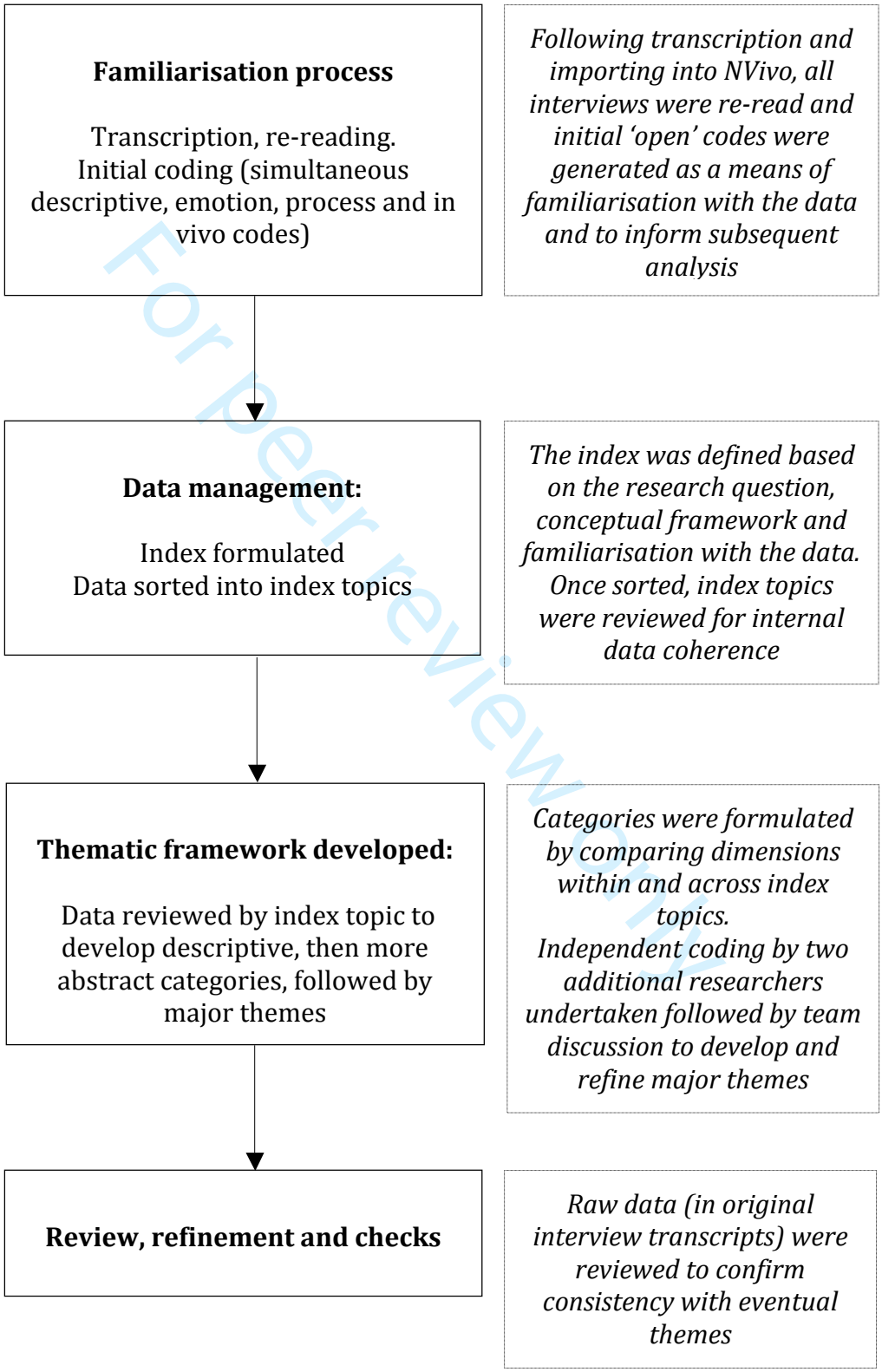
Physician and non-physician anaesthetists (if not already covered)

- Experience working together during NPA training?
- Experience working together after training?

Aspirations:

- How would you change NPA training and why?

## Coding/analytic strategy



The following tables show the index topics used for early data management and the distribution of coder:source.

Table 1: Index created for data management

| Index topic | Index subtopic |
|---|---|
| 1. How current training is delivered | 1.1 Getting into training<br>1.2 Training structures<br>1.3 Experiences in training<br>1.4 Trainers |
| 2. Transitioning to practice | |
| 3. Working after training | 3.1 Doing the job<br>3.2 Referral and supervision<br>3.3 CME and career development |
| 4. Relationships across cadres | 4.1 NPAs and PAs<br>4.2 Surgeons and NPAs<br>4.3 Other NPA cadres |
| 5. Aspirations | |
| 6. International interactions | 6.1 International involvement in training<br>6.2 Countries as comparators<br>6.3 Other |

Table 2: Coding personnel

| Coder | Transcripts coded |
|---|---|
| LB | SL1-2, S2, U1-5 |
| FB | SL1-3, S1-4, S6 |
| HE | SL1-3, S1-6, U1-6 |
| SKI | SL3, S1, S5, U4-6 |
| VT | S3-6, U1-3, U6 |

## Recruitment flow and participant characteristics

Table 3: Recruitment by country

| | Sierra Leone | Somaliland | Uganda |
|---|---|---|---|
| Approached | 9 (3N, 2P, 4S) | 8 (7N, 1S) | 8 (5N, 2P, 1S) |
| Declined | 1 (1S) | 0 | 1 (1N) |
| Did not respond | 4 (2N, 1P, 1S) | 1 (1N) | 1 (1N) |
| Accepted but unable to interview | 1 (1S) | 1 (1N) | 0 |
| Accepted and interviewed | 3 (1N, 1P, 1S) | 6 (5N, 1S) | 6 (3N, 2P, 1S) |

*N: non-physician anaesthetist; P: physician anaesthetist; S: surgeon*

Table 4: Gender of participants

| | Sierra Leone | Somaliland | Uganda |
|---|---|---|---|
| Male | 2 | 2 | 4 |
| Female | 1 | 4 | 2 |

One participant was previously known to the interviewer as a professional colleague. Seven were known to current or previous colleagues of the interviewer (but had no prior direct relationship with the interviewer). Seven were recruited through two or more intermediaries.

# Standards for Reporting Qualitative Research (SRQR)*

http://www.equator-network.org/reporting-guidelines/srqr/

| | Page no(s). |
|---|---|
| **Title and abstract** | |
| **Title** - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended | 1 |
| **Abstract** - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions | 2 |
| **Introduction** | |
| **Problem formulation** - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement | 4 |
| **Purpose or research question** - Purpose of the study and specific objectives or questions | 4 |
| **Methods** | |
| **Qualitative approach and research paradigm** - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale** | 7 |
| **Researcher characteristics and reflexivity** - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability | 7, online supplementary material, discussed p.20 |
| **Context** - Setting/site and salient contextual factors; rationale** | 5-6, 7 |
| **Sampling strategy** - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale** | 7-8, discussed p.19 |
| **Ethical issues pertaining to human subjects** - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues | 7, 8 |
| **Data collection methods** - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale** | 8, online supplementary material |

| | |
|---|---|
| **Data collection instruments and technologies** - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study | 8, online supplementary material |
| **Units of study** - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results) | 9, online supplementary material |
| **Data processing** - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts | 8, online supplementary material |
| **Data analysis** - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale** | 7-8, online supplementary material |
| **Techniques to enhance trustworthiness** - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale** | 8 |

**Results/findings**

| | |
|---|---|
| **Synthesis and interpretation** - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory | 9-17 |
| **Links to empirical data** - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings | 9-17 |

**Discussion**

| | |
|---|---|
| **Integration with prior work, implications, transferability, and contribution(s) to the field -** Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field | 18-19 |
| **Limitations** - Trustworthiness and limitations of findings | 19-20 |

**Other**

| | |
|---|---|
| **Conflicts of interest** - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed | 21 |
| **Funding** - Sources of funding and other support; role of funders in data collection, interpretation, and reporting | 21 |

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

**Reference:**

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
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BMJ Open

# Training non-physician anaesthetists in sub-Saharan Africa: a qualitative investigation of providers' perspectives

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# TRAINING NON-PHYSICIAN ANAESTHETISTS IN SUB-SAHARAN AFRICA: A QUALITATIVE INVESTIGATION OF PROVIDERS' PERSPECTIVES

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## ABSTRACT

**Objectives** To explore the views of non-physician anaesthesia providers (NPAPs) and their colleagues regarding the effectiveness of NPAP training programmes in three contrasting sub-Saharan African countries.

**Design** This was a qualitative exploratory descriptive study. Semi-structured interviews were conducted online, recorded, transcribed and analysed thematically using NVivo.

**Setting** Participants' homes or workplaces in Sierra Leone, Somaliland and Uganda.

**Participants** 15 NPAPs, physician anaesthetists and surgeons working in the countries concerned.

**Results** Three major themes were identified: 1) discrepancy between urban training and rural practice, 2) prominent development of attitudes outside the curricular set during training, including approaches to learning and clinical responsibility and 3) the importance of inter-professional relationships developed during training for later practice.

**Conclusions** Anaesthesia providers in different cadres and very different country contexts in sub-Saharan Africa describe common themes in training which appear to be significant for their later practice. Not all these issues are explicitly planned for in current training programmes, although they are important in the view of providers. Subsequent programme development should consider these themes with a view to enhancing the safety and quality of anaesthesia practice in this context.

**Keywords:** Anaesthetics; Medical Education and Training, Qualitative Research, Surgery**;** International health services.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- In-depth interview approach complements previous quantitative approaches to describing NPAP training.
- Online interviewing enabled greater reach to more remote participants.
- Rigour enhanced through analytical team approach
- Transferability to other settings in sub-Saharan Africa is likely to be limited, given the variation in health systems and institutions within the large region.
- Conducting the interviews in English may have limited the fluency and/or comprehension of participants.

## INTRODUCTION

A deficit of anaesthesia providers limits the availability of safe surgical care in sub-Saharan Africa (SSA).[1] Though there are multiple reasons for the deficit, inadequate training of providers is an important part of the problem.[2] Recent work which has demonstrated an overall shortfall in the anaesthesia workforce (physician and non-physician) in many low- and middle-income countries (LMICs) has also shown the relative importance of non-physician anaesthesia providers (NPAPs) for the majority of anaesthesia delivery in many of the same countries.[3] Thus recent calls for an increased focus on training quality[4] and training expansion within a task-sharing framework,[5,6] relate to non-physician as well as to physician anaesthesia providers.

Nonetheless, relatively little work so far has described the characteristics of current NPAP training models with a view to further development. Notable exceptions include a small number of narrative accounts of specific programmes which provide insight into their designed or intended structure and curricula,[7-9] and surveys of graduates which employed a quantitative approach to describe the efficacy of training in Ghana[10] and Sierra Leone.[11] Qualitative research in the field is even more scarce[12,13] although the potential of this approach has been recognised[4] and may be particularly valuable in capturing unintended and latent outcomes of training:[14] for example, while some challenges to the provision of safe anaesthesia are now quite well documented (such as equipment scarcity), the reflections of NPAPs themselves on how they are trained have not so far been examined in depth.

This study therefore employed an interview-based, qualitative approach to explore the views of qualified NPAPs and those who work closely with them professionally, about how NPAP training programmes prepare NPAPs for practice. It is hoped that this will complement the existing literature, and inform the development of existing and new NPAP training programmes. The study involved participants from three

different countries in SSA; the key features of the anaesthesia workforce and training structures in each country are now described.

A note on terminology: naming conventions vary worldwide. In this paper, the following definitions will be applied: a non-physician anaesthesia provider (NPAP) is any non-physician healthcare professional who has undergone dedicated anaesthesia training which results in a formal qualification allowing them to provide anaesthesia. This group includes nurse anaesthetists and clinical officer anaesthetists. A physician anaesthesia provider (PAP) is a physician who has undergone dedicated post-graduate anaesthesia training.

## Country contexts

### *Sierra Leone*

Sierra Leone (population: approx. 7.5 million)[15] has experienced particular challenges to its health system as a result of the civil war (1991-2002) and the recent Ebola outbreak (2014-2015); the latter in particular focused international attention on health system strengthening and workforce development.[16,17] Sierra Leone has a very small number of PAPs, all based in Freetown. Nurse anaesthetists (NAs) form the principal cadre of trained anaesthetic provider and have been trained in Sierra Leone since 2002, initially through an MSF-supported programme delivered by a visiting PAP and more recently through a similarly structured programme delivered by local PAPs, supported intermittently by international visitors and funded by the United Nations Fund for Population Activities.[11] The NA programme lasts 18 months and is based in Freetown, where most training is delivered (with the exception of short periods in provincial hospitals). In 2014 an additional training programme started for a new cadre who will assist anaesthesia providers, anaesthetic technicians. Approximately 130 NPAPs are thought to work in the country.[4]

### *Somaliland*

In common with Sierra Leone, Somaliland has experienced enormous challenges to its health system as a result of regional insecurity. Its unusual position as an

unrecognised state limits support from major international actors as well as its scope for ongoing economic development.[18] Training for anaesthetists (from nursing, midwifery or pharmacy backgrounds) has been delivered in a formal 18-month programme in two cities, Hargeisa (since 2013) and Boroma (since 2011), supported and delivered in Somaliland by Kenyan Registered Nurse Anaesthetists and a PAP based in Kenya. A previous single cohort of health officers (from a nursing background) were trained in 2006, supported by the Kings-THET-Somaliland Partnership,[19] but the majority of anaesthesia in Somaliland is still thought to be delivered by 'technicals', providers with limited or no training. No PAPs are working clinically in the country on a long-term basis. 31 NPAPs were practising in the country at the time of data collection, serving a population of around 4 million people.[20]

*Uganda*

The majority of anaesthesia providers in Uganda are anaesthetic officers (AOs) who complete a four-semester diploma in anaesthesia over two years, most commonly having a previous clinical officer qualification (although registered nurses, midwives and anaesthetic assistants may also undertake training). AO training in this format started in 1985, overseen by the Uganda Institute of Allied Health and Management Sciences. Until recently most training was delivered in Kampala with brief placements in district hospitals, but recent expansion has meant that several additional regional centres now also provide AO training programmes. Training is organised and delivered by senior AO tutors although physicians are also variably involved in theatre-based supervision and theoretical teaching. A new degree course for non-physician anaesthesia providers started in 2017. Currently it is estimated that there are around 540 AOs in Uganda and there has also been a rapid expansion in PAP numbers over the last decade, as international bodies have supported post-graduate training in anaesthesia for physicians.[21] Thus of the three countries, Uganda has the most well established NPAP training and also the greatest number of PAPs, serving a population of around 43 million.[22]

## METHODS

Ethical approval was sought and obtained for this study from the King's College London Research Ethics Committee (ref. LRU-16/17-3981), the Uganda National Council for Science and Technology (ref. HS30ES) and the Office of the Sierra Leone Ethics and Scientific Review Committee (no reference provided). Informed consent was obtained from all participants.

### Study design

In this qualitative study, in-depth interviews with clinical providers were conducted and analysed to explore their views on NPAP training programme effectiveness. The theoretical framework of the study was informed by Boone's evaluative model[14] and situated within a critical realist paradigm. Thematic analysis was consistent with Ormston's account of balance between deductive and inductive elements:[23] existing research and experience inevitably influenced the study design and early subtopic identification, but data collection and analysis were focused on information arising directly from interviewees, allowing space for new topics and themes to emerge which could then in turn be related back to existing knowledge. A position of 'empathic neutrality' was adopted, acknowledging that the identity of the researcher shapes the process of data collection, analysis and interpretation:[23] these issues are considered further in the discussion.

### Sampling

Three countries were selected for study based on their differing anaesthesia workforce makeup: Uganda, Sierra Leone and Somaliland. Clinical providers from three professional groups were recruited in each country: NPAPs from any cadre, physician anaesthetists (PAPs) and surgeons. The latter two groups, as those who work closely with NPAPs, were felt to offer an additional valuable perspective on NPAP training. A purposive approach was used to ensure that at least one respondent from each professional group was included from each country, with the exception of Somaliland where no PAPs were practising at the time of the study. Initial identification of potential respondents took place through networks known to the researchers and subsequently by 'snowballing' via existing respondents. Between nine and fifteen interviews were planned to allow sampling across all

professional groups in all countries. Respondents were approached digitally (email or online messenger) and provided with written information in advance. Consent was confirmed and recorded prior to the start of the interviews.

**Data collection**

Following pilot interviewing in the UK, all study interviews were conducted synchronously online using VoIP software (Skype or WhatsApp) by one interviewer (HE), in English, using an interview guide (online supplementary material), and audio recorded using "Call Recorder" (a Skype plugin) and/or "Audio Recorder" (an Android phone app); field notes were made contemporaneously. No interviews were repeated and no non-participants were present during interviews. Following interviews, all audio recordings were anonymised and transcribed by the interviewer. Participants were offered the opportunity to check and comment on their transcripts: two did so, one of whom responded with a single minor correction which was amended before analysis. Median interview duration was 46 minutes.

**Data analysis**

An iterative approach was undertaken using NVivo (qualitative data analysis software which facilitates sorting, arranging, linking and categorising data) to elicit and refine themes emerging from the data: initial open coding was used alongside field notes and analytic memos written during the coding process to generate a thematic framework within which further linkages and concepts could be understood (HE).[24] All data was then coded independently by two other team members after which findings were discussed among the team for consistency and agreement on emergent common themes (see online supplementary material). Alternate data sources (academic and grey literature) were used as an additional triangulation strategy to further develop understanding of the interview data.

**Patient and public involvement**

Patients and public were not directly involved in research design, recruitment or conduct of this study.

## RESULTS

In total 25 potential respondents were approached of whom 15 consented to be interviewed (six each from Somaliland and Uganda, and three from Sierra Leone; a more detailed summary of recruitment is provided in the online supplementary material). In total nine NPAPs, three PAPs and three surgeons were interviewed. Three major themes emerged, common to all settings, in relation to how NPAP training programmes prepared NPAPs for practice.

### Theme 1: Urban training does not always equip providers for rural practice

Common to all three countries is discrepancy between the predominantly urban location of training and subsequent work in more rural settings. Resource differences relate not only to equipment and drug availability but also to the availability of support and supervision. These differences are recognised by providers and trainers, and attempts are made to mitigate them.

The majority of training has been delivered in city hospitals which can provide adequate caseload and resourcing to support the students. However, many newly qualified NPAPs are allocated or deployed back to sponsoring hospitals to work, which may be distant from their training centre and considerably more limited or less consistent in terms of resources. Consequently, in some cases, NPAPs' training programmes have not equipped them to deal with their new working conditions, including lack of equipment, infrastructure, drugs and supporting personnel.

Such urban-rural differences were recognised by respondents in all settings and some efforts to address this problem were described: in Sierra Leone, students are explicitly encouraged during training to relate their urban experience to their rural practice, developing approaches and adaptability which they will need in future work.

*"Oftentimes, when they [students] do go out there, they come back and they say, well yes, but you told us this, but now we are out in the field, we're seeing something different… And you know, out in this part of the world, theory is one thing, but when they go out they find they have to adapt quite a lot. Because we train them with the hope that they will have all the equipment and consumables they need, but oftentimes it's unavailable. So you know… we try to bring this out in the classroom to say well, fine, if this is not available, so this is your plan B, this is your plan C, kind of thing." [SL1]*

In Uganda, where NPAP training is now offered in towns outside the capital, the need for training in 'rural' techniques including the use of ether anaesthesia is recognised.

*"Some hospitals are still using ether [...] In [city] they do not know ether [...] But we [district hospital] teach them about ether, so that when they go back, the only thing they have got, ether, they know." [U2]*

However, the difficulties of those who train in a centre with adequate facilities and move to one without are still considerable and include professional frustration, a sense of isolation and skill attrition.

*"From the place of training, the facilities are good. Go back to your district hospital, you don't see. From a place of training, some drugs are there. Going back to your workplace, your hospital of work, it is not there [...] all the equipment and drugs he used during the course of training is not there. So as one goes back there, he lose the skills [...] - if you visit that person after five years, from training, you'll find that he's a different person from the person he was at school." [U2]*

In Somaliland, this finding was least marked, perhaps because the majority of the trained nurse anaesthetists continue to practise in cities, with a minority moving

away to more remote areas. Nonetheless, the mismatch in resourcing between urban and rural settings is large.

*"[in contrast to the participant's city]...in some places they don't have any oxygen or any anaesthesia machine which have a ventilator [...] they don't have endotracheal tubes [...] they don't have most of drugs, even" [S6]*

**Theme 2: Developing learning skills and a sense of clinical responsibility are seen as key elements of training**

A striking feature of interviews with all respondents, when they reflected on how their training had prepared them for practice, was the focus on non-technical matters. While all acknowledged explicit curricular components of training (theory and practical, including skills such as intubation), they also considered how they had developed personally and professionally during training, and the influence of that development on their clinical practice. 'Soft' skills and attitudes such as self-directed learning, decision-making, communication and developing clinical responsibility were frequently mentioned. Two particular aspects of this theme are examined in more detail here: learning and clinical responsibility.

Learning

The learning experience of NPAPs during their training was marked by high levels of enthusiasm and motivation, as well as by some difficulties. NPAPs described their motivation for training principally in terms of personal interest or community loyalty (both of which appeared to persist into their working practice), and related their learning explicitly to these motivations. They described the active pursuit of learning opportunities during training, seeking out enthusiastic trainers, taking opportunities to practise procedures or favouring work at times when fewer trainees were around to compete for practical experience.

*"When I learn how to do spinal anaesthesia and general anaesthesia, I was very excited! I go home, I used to think about the patients we done and think about the patients we are going to do… all the time! [...] I take the chance to learn for the anaesthesia. When I was working, I was learning. I wasn't taking ever a day off." [S4]*

*"It's easier to learn at night. Much better, I mean, that's according to me, because there is no big competition. We are many students… so when you go during the day you are over ten people, and all of you want to intubate, all of you want to give a spinal. So [...] I found it easier to learn in the night." [U3]*

Learning during training was not always straightforward. Grappling with new theoretical concepts, difficulties accessing learning opportunities (because of insufficient caseload, or too many competing learners), unmotivated trainers or conflicts with other providers all made learning more difficult. Such problems were not glossed over in NPAPs' recollections of their training experience, but despite this, the overall commitment to and hunger for learning by trainees dominated providers' recall of their training.

*"And they really, really, want to learn. Really. They have a deep desire to learn, whatever it is that I will say during my course of time with them, as simple as it may be to me, to them they really value it." [U6]*

*"In textbook I follow the anaesthesia… pages. So when I see a new thing or new book, I try to read, try to gain knowledge. But it can't give the practicals. [….] Sometimes they talk about something I never heard. And you know that I try to Google and learn how..." [S4]*

Motivation to learn, the capacity to do so and the necessity of seizing learning opportunities when they arise is expressed and developed in training; a highly self-directed approach to learning in their subsequent practice was typical of the NPAPs interviewed. Although acquiring this approach might not have been officially

considered to be part of their formal training it was prominent in providers' recall of their training experience.

Responsibility

The development of clinical responsibility in training prepares NPAPs in part for the responsibility they will bear in practice, and was viewed by NPAPs both in a general sense (recognition of the 'life and death' nature of the job, the need for anaesthesia in improving health outcomes in the community) and in a specific sense, in terms of personal accountability for individual actions or inactions.

Several factors external to the student confer increasing levels of responsibility on them, such as levels of supervision (from immediate to distant), case allocation and acquisition of additional roles, as senior students start to supervise more junior colleagues (particularly commented on from Somaliland participants). The formality of these external structures varies:

*"We do have guidelines which were there - we're lucky that we had somebody who basically started the department a few years ago, I think immediately she saw that there was going to be…a problem so she came up with those guidelines. Some of them are like, you know, paediatrics less than six, ASA3 and above, several things of that nature. So they don't touch until they call, so there is a small booklet which you follow [...] in other places it is just word of mouth, people know that they do this and do that. So that's how it is, yeah." [U5]*

The sense of external factors conferring responsibility was balanced by key 'internal moments', which NPAPs identified on reflection on their own training. All were expressed in terms of recognising their responsibility for life and death, and were associated with specific cases:

*[first intubation] "It was the first time that I have to come in contact with a human being, and I know if I failed, it might be the end of the patient's life." [SL3]*

*"I remember, there is a boy, who was playing with a bomb - he didn't know it is a bomb or not, then it explode. He came here about 7.30pm. Then I saw him. He - his stomach was sitting beside him, and he's just - he wasn't crying. I thought, oh! What are we doing? We have to hurry, we have to do this case. Then we run. We take responsibility, we did that case. And we successfully done that case and he was… twelve years old… It was scary… he was talking and he was hurting, but I was thinking that we can save this boy. Yeah. If we do the right things, we can save him." [S4]*

Responsibility to challenge decisions was also highlighted, for example by this student who was being instructed to give a dangerous anaesthetic by a misinformed colleague:

*"Then he tell me, this is ketamine with atropine. Whole of bottle? Yes, whole of bottle! With atropine. So push it. Then I say I will not push for this one. Because I am not going to kill this patient...." [S1]*

The issue of responsibility is explicit in training for some students in Somaliland; not only must the student recognise their clinical responsibility, but the trainer is responsible to make sure they understand it:

*"My teacher teach me, so when I teach them to do the right things with the priority, so if they do wrong, or if they don't do the right things, you have to tell them. For the good, to do good, this is life, you can't lose a life [...] if you push the wrong medication, […] we can lose a life." [S4]*

Although NPAP students undertake considerable clinical responsibility during training, the transition to working practice still involved a step up. Some, but not all, programmes and hospitals put formal supervision in place for newly qualified

providers, which eased transition. Those working in the same hospital where they trained, or with other providers present, found the transition fairly straightforward:

*"I don't meet any problem. because there is a, some in anaesthesia before working me here, they support me, they give me support." [S5]*

*"We don't have problems, we [...] work as a team." [S3]*

Others, who worked alone, described a sense of isolation when they started their first job compared with their training experience: the need for them to work autonomously, to make decisions and speak up for themselves (and their patients), resulted in considerable strain.

*"This was like, from crawling to standing, all of a sudden, it - it was a very challenging moment… it was very challenging because I had to be in theatre […] Whatever happens, or whatever doesn't happen, it's all about me. So it was a very challenging moment, a very challenging time, I remember the very first days, I'd leave theatre with a headache because I'd freak out on almost everything [...] OK, now I can stand on my own, but it was different. Yeah." [U3]*

**Theme 3: Inter-professional relationships developed during training have implications for later practice.**

This theme exposes the greatest difference between the three countries studied, as a result of the different cadres of anaesthesia provider present in each. Common to all three countries was the influence of relationships developed during training on subsequent practice, in regard to both inter-cadre conflict and help-seeking for clinical situations.

In Uganda, NPAPs may work in theatre during their training with both PAPs in training and medical students, although their own programme is directed by senior

anaesthetic officers. This common space provided opportunities for positive interactions between cadres (role modelling, training) as well as negative interactions (competition for training opportunities, a sense of territorialism). The value of individual relationship building during training years to counter an inherited culture of opposition and suspicion, was highlighted by respondents in Uganda to a greater degree than in Somaliland or Sierra Leone.

*"So when you join the AO training culture, you will find a certain guy who'll say, I've had a bad experience with this anaesthesiologist, I've had a bad experience with this one, I've had a bad experience with this one… If you're really not that strong, you will keep thinking, OK, I might really have a bad experience with this one.*
*And then some hospitals where AOs are actually getting the chance to work with them, they are putting that hearsay behind… actually they are human beings, they are fine [….]. We may need her help, we can ask her help, she comes and helps. When she needs help, she comes and asks. But when, there are people in the school, when they've never actually interacted with an anaesthesiologist, or maybe they never even met in the same room, they fear that those people are not good." [U3]*

One physician also reflected on how the experience of training NPAPs helped develop his view of the cadre, influencing his subsequent relationship with individuals.

*"You just want them to talk. When you listen to their stories it's just humbling. Really humbling [...] They've saved more lives individually than all of us combined I think. I mean, they are truly unsung heroes." [U6]*

In all three countries, the relationships built during NPAPs' training programmes directly influenced subsequent help-seeking by practitioners. Four categories were apparent within this theme: case allocation and sharing of workload (where more than one provider is on the same site), referral of patients to another centre, advice-seeking, and supervision. Explicit criteria existed for case-allocation and referral in

some but not all centres, however advice-seeking and supervision were mostly dependent on who the initiator of the interaction knew, and on their in-training experience. Many transactions thus occurred between an NPAP and their previous trainer (of whichever cadre).

*"When we have difficulties, we usually call our instructor, that is a physician anaesthetist in [city]" [SL3]*

*"I remember one case that was a very difficult intubation because he had a burn contracture. We postponed that day, and we call one of our [old] teachers, he's in [neighbouring city]… then he come from [neighbouring city] and he help" [S3]*

*"I actually have a lot of contacts with many of them. Many of them still call me and they will still do cases together on phone and everything. But I think that that relationship comes from there - the moment they know that we don't know you, that's the end of it…. They just phone somebody they know." [U5]*

Thus, relationships developed in training are used for subsequent help-seeking in clinical practice, even across considerable geographic distance. Such 'task-sharing' interactions, although seldom explicitly described as such, occurred successfully but informally in all countries, largely in the absence of a formal task-sharing framework.

## DISCUSSION

The approach used for this study complements quantitative work in the same field:[4] the major themes identified have implications for the development and expansion of training and hence for the provision of safe anaesthesia.

Urban-rural inequity, well recognised in healthcare provision more broadly[25,26] has implications for the efficacy of training. If newly qualified anaesthesia providers meet situations and resources for which they have not been trained, problems with safety and quality of anaesthesia provision follow in the short term. In the long term, discouragement and problems with workforce retention can be anticipated. Ultimately, the aim must be to improve resource equity across all settings; however, in the interim, strategies such as those which are being developed in Sierra Leone and Uganda to increase the scope of training to encompass techniques and adaptations required in rural areas, the exposure of trainees to rural practice during their training, and the ongoing visits made by PAPs in Sierra Leone to their ex-trainees in the districts, should be promoted and encouraged.

Attitudinal aspects of training are challenging to establish in curricula in any setting,[27,28] but the impact of what NPAP students learn in this respect on their future practice should not be underestimated. This generally highly motivated group of trainees have to work hard to complete their training successfully, and carry their enthusiasm and self-direction into their subsequent practice, expressing high levels of interest in opportunities for continuing professional development (CPD) and career development. Similarly, through example and experience, a sense of clinical responsibility towards individual patients and local or national communities is developed in training, manifest as an imperative to practise safely, deliver quality, communicate clearly and where necessary handle conflict. The importance of training experiences and role models for individuals' development as clinical professionals is consistent with work in other groups and settings.[29,30]

Finally, relationships formed in training, at individual levels in particular, are significant for subsequent inter-cadre interactions in all three countries in the relative absence of formal task-sharing systems at a national level. While recognising and systematising task-sharing as part of national workforce strategies is recommended,[6] attention should also be paid to the value of positive inter-cadre and trainer-trainee relationships at the early stages of training which can both reduce conflict[31] and enhance task-sharing in its current form.

**Limitations**

Limitations apply to this study. Firstly, we recognise that the sample size is small, at 15 interviews, limited by resource and time constraints. Nonetheless, at this exploratory stage and using this methodology, the relatively small number of interviews was felt to be justifiable; in view of the depth and the relevant expertise of the interviewees on the subject in question, sufficient 'information power'[32] was generated to identify key themes of relevance to the subject. Data saturation (a complex concept)[33] was not formally used to determine sample size because analysis was conducted after the completion of data collection. However, we observed that analysis of the final two interviews did not reveal substantial new themes.

We note secondly that transferability is limited. Within SSA, countries and regions vary greatly with regard to their history, political, economic, cultural and healthcare systems. Although efforts were made to maximise the relevance of the findings within the region by selecting three countries disparate in their training models and PAP:NPAP workforce balance, and by purposively sampling data from three different clinical groups (PAPs, NPAPs and surgeons), in order to increase the diversity of situation and perspectives on the same question,[34] the breadth of contextual variation between countries in Africa means that the transferability of these findings to other countries on the continent must be limited. A future study might usefully expand both to other countries and to other key informants, such as NPAPs who have left practice, and NPAP students still in training.

Thirdly, although interviews were conducted in English, for some participants this was a second or even third language. This could have affected comprehension and fluency of the interview. Communication could also have been impaired because online interviews were conducted rather than face-to-face interviews. Synchronous online interviewing has some benefits in broadening the geographic remit of a study as well as putative advantages for interviewee comfort.[35] However rapport between interviewer and interviewee may be worse than in person, and non-verbal cues, especially visual ones, are more difficult or impossible to detect.[36]
Finally, issues of reflexivity must be considered. The position and person of the interviewer, and of the wider analysing team, are relevant.[23] The interviewer's identity as a British, white, female, consultant physician anaesthetist was known to all interviewees, and will have affected her assumptions, interactions with interviewees, and potentially interviewees' responses. Of the analytic team, four are based in the UK and one in Uganda. The UK team members have varying familiarity with one or more of the settings investigated, but all have experience in sub-Saharan Africa. All are physicians, which could have affected both their reading and understanding of the transcripts.

## Conclusion

Although training is by definition formative for practice (curricula are developed, placements are arranged, trainers train and assessments are held in order to prepare the trainee for a new role), training also affects practice in ways which have been less well recognised. This study used a qualitative approach to describe the experience of clinicians in sub-Saharan Africa with regard to NPAP training, finding that discrepancies between urban training and rural working, attitudinal development during training, and the importance of the relationships developed in training were important themes. These aspects of training warrant further exploration, particularly in regard to how they may be more intentionally implemented within training programmes, in order to assist the development and expansion of the NPAP workforce.

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**COMPETING INTERESTS**

None.

**CONTRIBUTORSHIP**

HE conceived and designed the study, completed data collection and analysis and drafted the paper for submission.

FB also contributed to the conception of the study, undertook data analysis and interpretation and critically revised the paper prior to submission.

LB, SKI and VT undertook data analysis and interpretation and critically revised the paper prior to submission.

**DATA SHARING**

Due to the commitment to preserve participants' anonymity and the small number and potential identifiability of participants, original interview recordings and transcripts cannot be made openly available.

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**SUPPLEMENTARY MATERIAL**

**Interview topic guide**

Preliminary information and checks:

- introductions and confirmation of interviewee's name
- recap purpose of the interview, optional nature, able to withdraw data
- confirm still willing to proceed as per consent form, timeframe
- confirm consents to be recorded

Opening questions:

- role/s and experience of the interviewee
- current and previous place/s of work, what is it like?
- local anaesthesia providers: who, how many, what training?
- what kind of experience / knowledge do they have about the wider situation in their country?

Training NPAPs:

- personal experience (NPAPs) or observation/involvement (others)
- what do they recall about training?
    - structure of their training
    - memorable events / experiences
    - content of training

The working practice of NPAs (with a view to then discussing the transition between training and working)

- either personal experience (NPAPs) or working with them (others)
- caseload and nature
- work outside the OR
- factors improving safety and quality of care, and barriers
- job satisfaction / dissatisfaction and reasons

Transition between training and working:

- recall the first day of work (if NPA)
- how well prepared were they? Did they have to adjust?
- what do they wish they knew then, that they know now?
- what is it like working with a newly qualified NPA (for non-NPAs)?

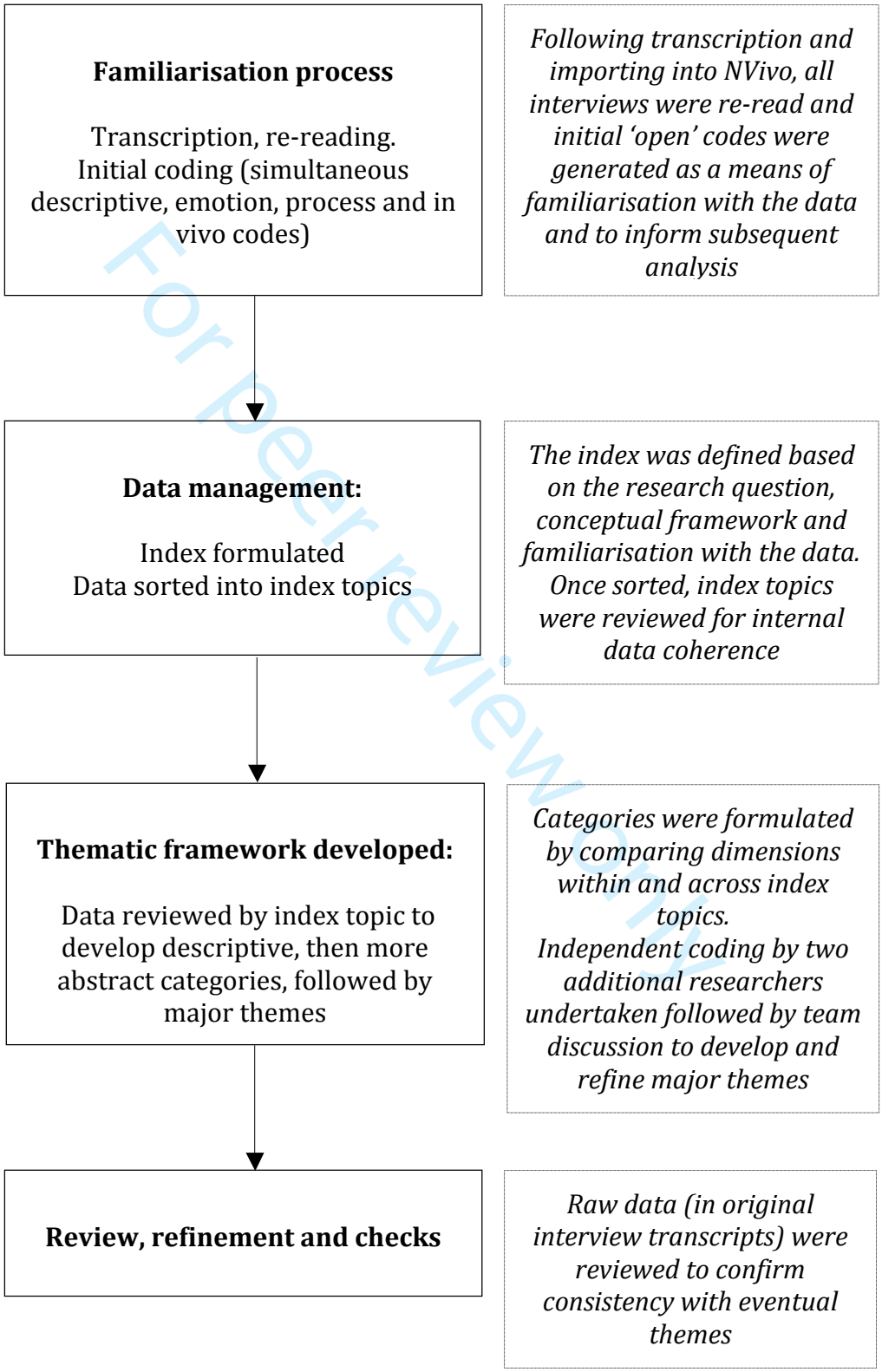
Physician and non-physician anaesthetists (if not already covered)

- Experience working together during NPA training?
- Experience working together after training?

Aspirations:

- How would you change NPA training and why?

## Coding/analytic strategy



The following tables show the index topics used for early data management and the distribution of coder:source.

Table 1: Index created for data management

| **Index topic** | **Index subtopic** |
|---|---|
| 1. How current training is delivered | 1.1 Getting into training<br>1.2 Training structures<br>1.3 Experiences in training<br>1.4 Trainers |
| 2. Transitioning to practice | |
| 3. Working after training | 3.1 Doing the job<br>3.2 Referral and supervision<br>3.3 CME and career development |
| 4. Relationships across cadres | 4.1 NPAs and PAs<br>4.2 Surgeons and NPAs<br>4.3 Other NPA cadres |
| 5. Aspirations | |
| 6. International interactions | 6.1 International involvement in training<br>6.2 Countries as comparators<br>6.3 Other |

Table 2: Coding personnel

| **Coder** | **Transcripts coded** |
|---|---|
| LB | SL1-2, S2, U1-5 |
| FB | SL1-3, S1-4, S6 |
| HE | SL1-3, S1-6, U1-6 |
| SKI | SL3, S1, S5, U4-6 |
| VT | S3-6, U1-3, U6 |

## Recruitment flow and participant characteristics

Table 3: Recruitment by country

| | Sierra Leone | Somaliland | Uganda |
|---|---|---|---|
| Approached | 9 (3N, 2P, 4S) | 8 (7N, 1S) | 8 (5N, 2P, 1S) |
| Declined | 1 (1S) | 0 | 1 (1N) |
| Did not respond | 4 (2N, 1P, 1S) | 1 (1N) | 1 (1N) |
| Accepted but unable to interview | 1 (1S) | 1 (1N) | 0 |
| Accepted and interviewed | 3 (1N, 1P, 1S) | 6 (5N, 1S) | 6 (3N, 2P, 1S) |

*N: non-physician anaesthetist; P: physician anaesthetist; S: surgeon*

Table 4: Gender of participants

| | Sierra Leone | Somaliland | Uganda |
|---|---|---|---|
| Male | 2 | 2 | 4 |
| Female | 1 | 4 | 2 |

One participant was previously known to the interviewer as a professional colleague. Seven were known to current or previous colleagues of the interviewer (but had no prior direct relationship with the interviewer). Seven were recruited through two or more intermediaries.

# Standards for Reporting Qualitative Research (SRQR)*

http://www.equator-network.org/reporting-guidelines/srqr/

| | Page no(s). |
|---|---|
| **Title and abstract** | |
| **Title** - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended | 1 |
| **Abstract** - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions | 2 |
| **Introduction** | |
| **Problem formulation** - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement | 4 |
| **Purpose or research question** - Purpose of the study and specific objectives or questions | 4 |
| **Methods** | |
| **Qualitative approach and research paradigm** - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale** | 7 |
| **Researcher characteristics and reflexivity** - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability | 7, online supplementary material, discussed p.20 |
| **Context** - Setting/site and salient contextual factors; rationale** | 5-6, 7 |
| **Sampling strategy** - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale** | 7-8, discussed p.19 |
| **Ethical issues pertaining to human subjects** - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues | 7, 8 |
| **Data collection methods** - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale** | 8, online supplementary material |

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|---|---|
| **Data collection instruments and technologies** - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study | 8, online supplementary material |
| **Units of study** - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results) | 9, online supplementary material |
| **Data processing** - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts | 8, online supplementary material |
| **Data analysis** - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale** | 7-8, online supplementary material |
| **Techniques to enhance trustworthiness** - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale** | 8 |

**Results/findings**

| | |
|---|---|
| **Synthesis and interpretation** - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory | 9-17 |
| **Links to empirical data** - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings | 9-17 |

**Discussion**

| | |
|---|---|
| **Integration with prior work, implications, transferability, and contribution(s) to the field -** Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field | 18-19 |
| **Limitations** - Trustworthiness and limitations of findings | 19-20 |

**Other**

| | |
|---|---|
| **Conflicts of interest** - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed | 21 |
| **Funding** - Sources of funding and other support; role of funders in data collection, interpretation, and reporting | 21 |

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

**Reference:**

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
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# Training non-physician anaesthetists in sub-Saharan Africa: a qualitative investigation of providers' perspectives

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# TRAINING NON-PHYSICIAN ANAESTHETISTS IN SUB-SAHARAN AFRICA: A QUALITATIVE INVESTIGATION OF PROVIDERS' PERSPECTIVES

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## ABSTRACT

**Objectives** To explore the views of non-physician anaesthesia providers (NPAPs) and their colleagues regarding the effectiveness of NPAP training programmes in three contrasting sub-Saharan African countries.

**Design** This was a qualitative exploratory descriptive study. Semi-structured interviews were conducted online, recorded, transcribed and analysed thematically using NVivo.

**Setting** Participants' homes or workplaces in Sierra Leone, Somaliland and Uganda.

**Participants** 15 NPAPs, physician anaesthetists and surgeons working in the countries concerned.

**Results** Three major themes were identified: 1) discrepancy between urban training and rural practice, 2) prominent development of attitudes outside the curricular set during training, including approaches to learning and clinical responsibility and 3) the importance of inter-professional relationships developed during training for later practice.

**Conclusions** Anaesthesia providers in different cadres and very different country contexts in sub-Saharan Africa describe common themes in training which appear to be significant for their later practice. Not all these issues are explicitly planned for in current training programmes, although they are important in the view of providers. Subsequent programme development should consider these themes with a view to enhancing the safety and quality of anaesthesia practice in this context.

**Keywords:** Anaesthetics; Medical Education and Training, Qualitative Research, Surgery**;** International health services.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- In-depth interview approach complements previous quantitative approaches to describing NPAP training.
- Online interviewing enabled greater reach to more remote participants.
- Rigour enhanced through analytical team approach
- Transferability to other settings in sub-Saharan Africa is likely to be limited, given the variation in health systems and institutions within the large region.
- Conducting the interviews in English may have limited the fluency and/or comprehension of participants.

## INTRODUCTION

A deficit of anaesthesia providers limits the availability of safe surgical care in sub-Saharan Africa (SSA).[1] Though there are multiple reasons for the deficit, inadequate training of providers is an important part of the problem.[2] Recent work which has demonstrated an overall shortfall in the anaesthesia workforce (physician and non-physician) in many low- and middle-income countries (LMICs) has also shown the relative importance of non-physician anaesthesia providers (NPAPs) for the majority of anaesthesia delivery in many of the same countries.[3] Thus recent calls for an increased focus on training quality[4] and training expansion within a task-sharing framework,[5,6] relate to non-physician as well as to physician anaesthesia providers.

Nonetheless, relatively little work so far has described the characteristics of current NPAP training models with a view to further development. Notable exceptions include a small number of narrative accounts of specific programmes which provide insight into their designed or intended structure and curricula,[7-9] and surveys of graduates which employed a quantitative approach to describe the efficacy of training in Ghana[10] and Sierra Leone.[11] Qualitative research in the field is even more scarce[12,13] although the potential of this approach has been recognised[4] and may be particularly valuable in capturing unintended and latent outcomes of training:[14] for example, while some challenges to the provision of safe anaesthesia are now quite well documented (such as equipment scarcity), the reflections of NPAPs themselves on how they are trained have not so far been examined in depth.

This study therefore employed an interview-based, qualitative approach to explore the views of qualified NPAPs and those who work closely with them professionally, about how NPAP training programmes prepare NPAPs for practice. It is hoped that this will complement the existing literature, and inform the development of existing and new NPAP training programmes. The study involved participants from three

different countries in SSA; the key features of the anaesthesia workforce and training structures in each country are now described.

A note on terminology: naming conventions vary worldwide. In this paper, the following definitions will be applied: a non-physician anaesthesia provider (NPAP) is any non-physician healthcare professional who has undergone dedicated anaesthesia training which results in a formal qualification allowing them to provide anaesthesia. This group includes nurse anaesthetists and clinical officer anaesthetists. A physician anaesthesia provider (PAP) is a physician who has undergone dedicated post-graduate anaesthesia training.

## Country contexts

### *Sierra Leone*

Sierra Leone (population: approx. 7.5 million)[15] has experienced particular challenges to its health system as a result of the civil war (1991-2002) and the recent Ebola outbreak (2014-2015); the latter in particular focused international attention on health system strengthening and workforce development.[16,17] Sierra Leone has a very small number of PAPs, all based in Freetown. Nurse anaesthetists (NAs) form the principal NPAP cadre and have been trained in Sierra Leone since 2002, initially through an MSF-supported programme delivered by a visiting PAP and more recently through a similarly structured programme delivered by local PAPs, supported intermittently by international visitors and funded by the United Nations Fund for Population Activities.[11] The NA programme lasts 18 months and is based in Freetown, where most training is delivered (with the exception of short periods in provincial hospitals). In 2014 an additional training programme started for a new cadre, anaesthetic technicians. Approximately 130 NPAPs are thought to work in the country.[4]

### *Somaliland*

In common with Sierra Leone, Somaliland has experienced enormous challenges to its health system as a result of regional insecurity. Its unusual position as an unrecognised state limits support from major international actors as well as its

scope for ongoing economic development.[18] Training for NPAPs (from nursing, midwifery or pharmacy backgrounds) has been delivered in a formal 18-month programme in two cities, Hargeisa (since 2013) and Boroma (since 2011), supported and delivered in Somaliland by Kenyan Registered Nurse Anaesthetists and a PAP based in Kenya. A previous single cohort of health officers (from a nursing background) were trained in 2006, supported by the Kings-THET-Somaliland Partnership,[19] but the majority of anaesthesia in Somaliland is still thought to be delivered by 'technicals', providers with limited or no training. No PAPs are working clinically in the country on a long-term basis. 31 NPAPs were practising in the country at the time of data collection, serving a population of around 4 million people.[20]

*Uganda*

The majority of anaesthesia providers in Uganda are anaesthetic officers (AOs) who complete a four-semester diploma in anaesthesia over two years, most commonly having a previous clinical officer qualification (although registered nurses, midwives and anaesthetic assistants may also undertake training). AO training in this format started in 1985, overseen by the Uganda Institute of Allied Health and Management Sciences. Until recently most training was delivered in Kampala with brief placements in district hospitals, but recent expansion has meant that several additional regional centres now also provide AO training programmes. Training is organised and delivered by senior AO tutors although physicians are also variably involved in theatre-based supervision and theoretical teaching. A new degree course for non-physician anaesthesia providers started in 2017. Currently it is estimated that there are around 540 AOs in Uganda and there has also been a rapid expansion in PAP numbers over the last decade, as international bodies have supported post-graduate training in anaesthesia for physicians.[21] Thus of the three countries, Uganda has the most well established NPAP training and also the greatest number of PAPs, serving a population of around 43 million.[22]

## METHODS

Ethical approval was sought and obtained for this study from the King's College London Research Ethics Committee (ref. LRU-16/17-3981), the Uganda National Council for Science and Technology (ref. HS30ES) and the Office of the Sierra Leone Ethics and Scientific Review Committee (no reference provided). Informed consent was obtained from all participants.

### Study design

In this qualitative study, in-depth interviews with clinical providers were conducted and analysed to explore their views on NPAP training programme effectiveness. The theoretical framework of the study was informed by Boone's evaluative model[14] and situated within a critical realist paradigm. Thematic analysis was consistent with Ormston's account of balance between deductive and inductive elements:[23] existing research and experience inevitably influenced the study design and early subtopic identification, but data collection and analysis were focused on information arising directly from interviewees, allowing space for new topics and themes to emerge which could then in turn be related back to existing knowledge. A position of 'empathic neutrality' was adopted, acknowledging that the identity of the researcher shapes the process of data collection, analysis and interpretation:[23] these issues are considered further in the discussion.

### Sampling

Three countries were selected for study based on their differing anaesthesia workforce makeup: Uganda, Sierra Leone and Somaliland. Clinical providers from three professional groups were recruited in each country: NPAPs from any cadre, physician anaesthetists (PAPs) and surgeons. The latter two groups, as those who work closely with NPAPs, were felt to offer an additional valuable perspective on NPAP training. A purposive approach was used to ensure that at least one respondent from each professional group was included from each country, with the exception of Somaliland where no PAPs were practising at the time of the study. Initial identification of potential respondents took place through networks known to the researchers and subsequently by 'snowballing' via existing respondents. Between nine and fifteen interviews were planned to allow sampling across all

professional groups in all countries. Respondents were approached digitally (email or online messenger) and provided with written information in advance. Consent was confirmed and recorded prior to the start of the interviews.

**Data collection**

Following pilot interviewing in the UK, all study interviews were conducted synchronously online using VoIP software (Skype or WhatsApp) by one interviewer (HE), in English, using an interview guide (online supplementary material), and audio recorded using "Call Recorder" (a Skype plugin) and/or "Audio Recorder" (an Android phone app); field notes were made contemporaneously. No interviews were repeated and no non-participants were present during interviews. Following interviews, all audio recordings were anonymised and transcribed by the interviewer. Participants were offered the opportunity to check and comment on their transcripts: two did so, one of whom responded with a single minor correction which was amended before analysis. Median interview duration was 46 minutes.

**Data analysis**

An iterative approach was undertaken using NVivo (qualitative data analysis software which facilitates sorting, arranging, linking and categorising data) to elicit and refine themes emerging from the data: initial open coding was used alongside field notes and analytic memos written during the coding process to generate a thematic framework within which further linkages and concepts could be understood (HE).[24] All data was then coded independently by two other team members after which findings were discussed among the team for consistency and agreement on emergent common themes (see online supplementary material). Alternate data sources (academic and grey literature) were used as an additional triangulation strategy to further develop understanding of the interview data.

**Patient and public involvement**

Patients and public were not directly involved in research design, recruitment or conduct of this study.

## RESULTS

In total 25 potential respondents were approached of whom 15 consented to be interviewed (six each from Somaliland and Uganda, and three from Sierra Leone; a more detailed summary of recruitment is provided in the online supplementary material). In total nine NPAPs, three PAPs and three surgeons were interviewed. Three major themes emerged, common to all settings, in relation to how NPAP training programmes prepared NPAPs for practice.

### Theme 1: Urban training does not always equip providers for rural practice

Common to all three countries is discrepancy between the predominantly urban location of training and subsequent work in more rural settings. Resource differences relate not only to equipment and drug availability but also to the availability of support and supervision. These differences are recognised by providers and trainers, and attempts are made to mitigate them.

The majority of training has been delivered in city hospitals which can provide adequate caseload and resourcing to support the students. However, many newly qualified NPAPs are allocated or deployed back to sponsoring hospitals to work, which may be distant from their training centre and considerably more limited or less consistent in terms of resources. Consequently, in some cases, NPAPs' training programmes have not equipped them to deal with their new working conditions, including lack of equipment, infrastructure, drugs and supporting personnel.

Such urban-rural differences were recognised by respondents in all settings and some efforts to address this problem were described: in Sierra Leone, students are explicitly encouraged during training to relate their urban experience to their rural practice, developing approaches and adaptability which they will need in future work.

*"Oftentimes, when they [students] do go out there, they come back and they say, well yes, but you told us this, but now we are out in the field, we're seeing something different… And you know, out in this part of the world, theory is one thing, but when they go out they find they have to adapt quite a lot. Because we train them with the hope that they will have all the equipment and consumables they need, but oftentimes it's unavailable. So you know… we try to bring this out in the classroom to say well, fine, if this is not available, so this is your plan B, this is your plan C, kind of thing." [SL1]*

In Uganda, where NPAP training is now offered in towns outside the capital, the need for training in 'rural' techniques including the use of ether anaesthesia is recognised.

*"Some hospitals are still using ether [...] In [city] they do not know ether [...] But we [district hospital] teach them about ether, so that when they go back, the only thing they have got, ether, they know." [U2]*

However, the difficulties of those who train in a centre with adequate facilities and move to one without are still considerable and include professional frustration, a sense of isolation and skill attrition.

*"From the place of training, the facilities are good. Go back to your district hospital, you don't see. From a place of training, some drugs are there. Going back to your workplace, your hospital of work, it is not there [...] all the equipment and drugs he used during the course of training is not there. So as one goes back there, he lose the skills [...] - if you visit that person after five years, from training, you'll find that he's a different person from the person he was at school." [U2]*

In Somaliland, this finding was least marked, perhaps because the majority of the trained nurse anaesthetists continue to practise in cities, with a minority moving

away to more remote areas. Nonetheless, the mismatch in resourcing between urban and rural settings is large.

*"[in contrast to the participant's city]...in some places they don't have any oxygen or any anaesthesia machine which have a ventilator [...] they don't have endotracheal tubes [...] they don't have most of drugs, even" [S6]*

**Theme 2: Developing learning skills and a sense of clinical responsibility are seen as key elements of training**

A striking feature of interviews with all respondents, when they reflected on how their training had prepared them for practice, was the focus on non-technical matters. While all acknowledged explicit curricular components of training (theory and practical, including skills such as intubation), they also considered how they had developed personally and professionally during training, and the influence of that development on their clinical practice. 'Soft' skills and attitudes such as self-directed learning, decision-making, communication and developing clinical responsibility were frequently mentioned. Two particular aspects of this theme are examined in more detail here: learning and clinical responsibility.

Learning

The learning experience of NPAPs during their training was marked by high levels of enthusiasm and motivation, as well as by some difficulties. NPAPs described their motivation for training principally in terms of personal interest or community loyalty (both of which appeared to persist into their working practice), and related their learning explicitly to these motivations. They described the active pursuit of learning opportunities during training, seeking out enthusiastic trainers, taking opportunities to practise procedures or favouring work at times when fewer trainees were around to compete for practical experience.

*"When I learn how to do spinal anaesthesia and general anaesthesia, I was very excited! I go home, I used to think about the patients we done and think about the patients we are going to do… all the time! [...] I take the chance to learn for the anaesthesia. When I was working, I was learning. I wasn't taking ever a day off." [S4]*

*"It's easier to learn at night. Much better, I mean, that's according to me, because there is no big competition. We are many students… so when you go during the day you are over ten people, and all of you want to intubate, all of you want to give a spinal. So [...] I found it easier to learn in the night." [U3]*

Learning during training was not always straightforward. Grappling with new theoretical concepts, difficulties accessing learning opportunities (because of insufficient caseload, or too many competing learners), unmotivated trainers or conflicts with other providers all made learning more difficult. Such problems were not glossed over in NPAPs' recollections of their training experience, but despite this, the overall commitment to and hunger for learning by trainees dominated providers' recall of their training.

*"And they really, really, want to learn. Really. They have a deep desire to learn, whatever it is that I will say during my course of time with them, as simple as it may be to me, to them they really value it." [U6]*

*"In textbook I follow the anaesthesia… pages. So when I see a new thing or new book, I try to read, try to gain knowledge. But it can't give the practicals. [….] Sometimes they talk about something I never heard. And you know that I try to Google and learn how..." [S4]*

Motivation to learn, the capacity to do so and the necessity of seizing learning opportunities when they arise is expressed and developed in training; a highly self-directed approach to learning in their subsequent practice was typical of the NPAPs interviewed. Although acquiring this approach might not have been officially

considered to be part of their formal training it was prominent in providers' recall of their training experience.

Responsibility

The development of clinical responsibility in training prepares NPAPs in part for the responsibility they will bear in practice, and was viewed by NPAPs both in a general sense (recognition of the 'life and death' nature of the job, the need for anaesthesia in improving health outcomes in the community) and in a specific sense, in terms of personal accountability for individual actions or inactions.

Several factors external to the student confer increasing levels of responsibility on them, such as levels of supervision (from immediate to distant), case allocation and acquisition of additional roles, as senior students start to supervise more junior colleagues (particularly commented on from Somaliland participants). The formality of these external structures varies:

*"We do have guidelines which were there - we're lucky that we had somebody who basically started the department a few years ago, I think immediately she saw that there was going to be…a problem so she came up with those guidelines. Some of them are like, you know, paediatrics less than six, ASA3 and above, several things of that nature. So they don't touch until they call, so there is a small booklet which you follow [...] in other places it is just word of mouth, people know that they do this and do that. So that's how it is, yeah." [U5]*

The sense of external factors conferring responsibility was balanced by key 'internal moments', which NPAPs identified on reflection on their own training. All were expressed in terms of recognising their responsibility for life and death, and were associated with specific cases:

*[first intubation] "It was the first time that I have to come in contact with a human being, and I know if I failed, it might be the end of the patient's life." [SL3]*

*"I remember, there is a boy, who was playing with a bomb - he didn't know it is a bomb or not, then it explode. He came here about 7.30pm. Then I saw him. He - his stomach was sitting beside him, and he's just - he wasn't crying. I thought, oh! What are we doing? We have to hurry, we have to do this case. Then we run. We take responsibility, we did that case. And we successfully done that case and he was… twelve years old… It was scary… he was talking and he was hurting, but I was thinking that we can save this boy. Yeah. If we do the right things, we can save him." [S4]*

Responsibility to challenge decisions was also highlighted, for example by this student who was being instructed to give a dangerous anaesthetic by a misinformed colleague:

*"Then he tell me, this is ketamine with atropine. Whole of bottle? Yes, whole of bottle! With atropine. So push it. Then I say I will not push for this one. Because I am not going to kill this patient...." [S1]*

The issue of responsibility is explicit in training for some students in Somaliland; not only must the student recognise their clinical responsibility, but the trainer is responsible to make sure they understand it:

*"My teacher teach me, so when I teach them to do the right things with the priority, so if they do wrong, or if they don't do the right things, you have to tell them. For the good, to do good, this is life, you can't lose a life [...] if you push the wrong medication, […] we can lose a life." [S4]*

Although NPAP students undertake considerable clinical responsibility during training, the transition to working practice still involved a step up. Some, but not all, programmes and hospitals put formal supervision in place for newly qualified

providers, which eased transition. Those working in the same hospital where they trained, or with other providers present, found the transition fairly straightforward:

*"I don't meet any problem. because there is a, some in anaesthesia before working me here, they support me, they give me support." [S5]*

*"We don't have problems, we [...] work as a team." [S3]*

Others, who worked alone, described a sense of isolation when they started their first job compared with their training experience: the need for them to work autonomously, to make decisions and speak up for themselves (and their patients), resulted in considerable strain.

*"This was like, from crawling to standing, all of a sudden, it - it was a very challenging moment… it was very challenging because I had to be in theatre […] Whatever happens, or whatever doesn't happen, it's all about me. So it was a very challenging moment, a very challenging time, I remember the very first days, I'd leave theatre with a headache because I'd freak out on almost everything [...] OK, now I can stand on my own, but it was different. Yeah." [U3]*

**Theme 3: Inter-professional relationships developed during training have implications for later practice.**

This theme exposes the greatest difference between the three countries studied, as a result of the different cadres of anaesthesia provider present in each. Common to all three countries was the influence of relationships developed during training on subsequent practice, in regard to both inter-cadre conflict and help-seeking for clinical situations.

In Uganda, NPAPs may work in theatre during their training with both PAPs in training and medical students, although their own programme is directed by senior

anaesthetic officers. This common space provided opportunities for positive interactions between cadres (role modelling, training) as well as negative interactions (competition for training opportunities, a sense of territorialism). The value of individual relationship building during training years to counter an inherited culture of opposition and suspicion, was highlighted by respondents in Uganda to a greater degree than in Somaliland or Sierra Leone.

*"So when you join the AO training culture, you will find a certain guy who'll say, I've had a bad experience with this anaesthesiologist, I've had a bad experience with this one, I've had a bad experience with this one… If you're really not that strong, you will keep thinking, OK, I might really have a bad experience with this one.*
*And then some hospitals where AOs are actually getting the chance to work with them, they are putting that hearsay behind… actually they are human beings, they are fine [….]. We may need her help, we can ask her help, she comes and helps. When she needs help, she comes and asks. But when, there are people in the school, when they've never actually interacted with an anaesthesiologist, or maybe they never even met in the same room, they fear that those people are not good." [U3]*

One physician also reflected on how the experience of training NPAPs helped develop his view of the cadre, influencing his subsequent relationship with individuals.

*"You just want them to talk. When you listen to their stories it's just humbling. Really humbling [...] They've saved more lives individually than all of us combined I think. I mean, they are truly unsung heroes." [U6]*

In all three countries, the relationships built during NPAPs' training programmes directly influenced subsequent help-seeking by practitioners. Four categories were apparent within this theme: case allocation and sharing of workload (where more than one provider is on the same site), referral of patients to another centre, advice-seeking, and supervision. Explicit criteria existed for case-allocation and referral in

some but not all centres, however advice-seeking and supervision were mostly dependent on who the initiator of the interaction knew, and on their in-training experience. Many transactions thus occurred between an NPAP and their previous trainer (of whichever cadre).

*"When we have difficulties, we usually call our instructor, that is a physician anaesthetist in [city]" [SL3]*

*"I remember one case that was a very difficult intubation because he had a burn contracture. We postponed that day, and we call one of our [old] teachers, he's in [neighbouring city]… then he come from [neighbouring city] and he help" [S3]*

*"I actually have a lot of contacts with many of them. Many of them still call me and they will still do cases together on phone and everything. But I think that that relationship comes from there - the moment they know that we don't know you, that's the end of it…. They just phone somebody they know." [U5]*

Thus, relationships developed in training are used for subsequent help-seeking in clinical practice, even across considerable geographic distance. Such 'task-sharing' interactions, although seldom explicitly described as such, occurred successfully but informally in all countries, largely in the absence of a formal task-sharing framework.

## DISCUSSION

The approach used for this study complements quantitative work in the same field:[4] the major themes identified have implications for the development and expansion of training and hence for the provision of safe anaesthesia.

Urban-rural inequity, well recognised in healthcare provision more broadly[25,26] has implications for the efficacy of training. If newly qualified anaesthesia providers meet situations and resources for which they have not been trained, problems with safety and quality of anaesthesia provision follow in the short term. In the long term, discouragement and problems with workforce retention can be anticipated. Ultimately, the aim must be to improve resource equity across all settings; however, in the interim, strategies such as those which are being developed in Sierra Leone and Uganda to increase the scope of training to encompass techniques and adaptations required in rural areas, the exposure of trainees to rural practice during their training, and the ongoing visits made by PAPs in Sierra Leone to their ex-trainees in the districts, should be promoted and encouraged.

Attitudinal aspects of training are challenging to establish in curricula in any setting,[27,28] but the impact of what NPAP students learn in this respect on their future practice should not be underestimated. This generally highly motivated group of trainees have to work hard to complete their training successfully, and carry their enthusiasm and self-direction into their subsequent practice, expressing high levels of interest in opportunities for continuing professional development (CPD) and career development. Similarly, through example and experience, a sense of clinical responsibility towards individual patients and local or national communities is developed in training, manifest as an imperative to practise safely, deliver quality, communicate clearly and where necessary handle conflict. The importance of training experiences and role models for individuals' development as clinical professionals is consistent with work in other groups and settings.[29,30]

Finally, relationships formed in training, at individual levels in particular, are significant for subsequent inter-cadre interactions in all three countries in the relative absence of formal task-sharing systems at a national level. While recognising and systematising task-sharing as part of national workforce strategies is recommended,[6] attention should also be paid to the value of positive inter-cadre and trainer-trainee relationships at the early stages of training which can both reduce conflict[31] and enhance task-sharing in its current form.

**Limitations**

Limitations apply to this study. Firstly, we recognise that the sample size is small, at 15 interviews, limited by resource and time constraints. Nonetheless, at this exploratory stage and using this methodology, the relatively small number of interviews was felt to be justifiable; in view of the depth and the relevant expertise of the interviewees on the subject in question, sufficient 'information power'[32] was generated to identify key themes of relevance to the subject. Data saturation (a complex concept)[33] was not formally used to determine sample size because analysis was conducted after the completion of data collection. However, we observed that analysis of the final two interviews did not reveal substantial new themes.

We note secondly that transferability is limited. Within SSA, countries and regions vary greatly with regard to their history, political, economic, cultural and healthcare systems. Although efforts were made to maximise the relevance of the findings within the region by selecting three countries disparate in their training models and PAP:NPAP workforce balance, and by purposively sampling data from three different clinical groups (PAPs, NPAPs and surgeons), in order to increase the diversity of situation and perspectives on the same question,[34] the breadth of contextual variation between countries in Africa means that the transferability of these findings to other countries on the continent must be limited. A future study might usefully expand both to other countries and to other key informants, such as

NPAP students still in training, or NPAPs who have left practice (including exploration of their reasons for leaving).

Thirdly, although interviews were conducted in English, for some participants this was their second or even third language. This could have affected comprehension and fluency of the interview. Communication could also have been impaired because online interviews were conducted rather than face-to-face interviews. Synchronous online interviewing has some benefits in broadening the geographic remit of a study as well as putative advantages for interviewee comfort.[35] However rapport between interviewer and interviewee may be worse than in person, and non-verbal cues, especially visual ones, are more difficult or impossible to detect.[36]

Finally, issues of reflexivity must be considered. The position and person of the interviewer, and of the wider analysing team, are relevant.[23] The interviewer's identity as a British, white, female, consultant physician anaesthetist was known to all interviewees, and will have affected her assumptions, interactions with interviewees, and potentially interviewees' responses. Of the analytic team, four are based in the UK and one in Uganda. The UK team members have varying familiarity with one or more of the settings investigated, but all have experience in sub-Saharan Africa. All are physicians, which could have affected both their reading and understanding of the transcripts.

## Conclusion

Although training is by definition formative for practice (curricula are developed, placements are arranged, trainers train and assessments are held in order to prepare the trainee for a new role), training also affects practice in ways which have been less well recognised. This study used a qualitative approach to describe the experience of clinicians in sub-Saharan Africa with regard to NPAP training, finding that discrepancies between urban training and rural working, attitudinal development during training, and the importance of the relationships developed in training were important themes. These aspects of training warrant further exploration, particularly in regard to how they may be more intentionally

implemented within training programmes, in order to assist the development and expansion of the NPAP workforce.

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**COMPETING INTERESTS**

None.

**CONTRIBUTORSHIP**

HE conceived and designed the study, completed data collection and analysis and drafted the paper for submission.

FB also contributed to the conception of the study, undertook data analysis and interpretation and critically revised the paper prior to submission.

LB, SKI and VT undertook data analysis and interpretation and critically revised the paper prior to submission.

**DATA SHARING**

Due to the commitment to preserve participants' anonymity and the small number and potential identifiability of participants, original interview recordings and transcripts cannot be made openly available.

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- For early comments on the manuscript: Dr. Niall Winters

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**SUPPLEMENTARY MATERIAL**

**Interview topic guide**

Preliminary information and checks:

- introductions and confirmation of interviewee's name
- recap purpose of the interview, optional nature, able to withdraw data
- confirm still willing to proceed as per consent form, timeframe
- confirm consents to be recorded

Opening questions:

- role/s and experience of the interviewee
- current and previous place/s of work, what is it like?
- local anaesthesia providers: who, how many, what training?
- what kind of experience / knowledge do they have about the wider situation in their country?

Training NPAPs:

- personal experience (NPAPs) or observation/involvement (others)
- what do they recall about training?
    - structure of their training
    - memorable events / experiences
    - content of training

The working practice of NPAs (with a view to then discussing the transition between training and working)

- either personal experience (NPAPs) or working with them (others)
- caseload and nature
- work outside the OR
- factors improving safety and quality of care, and barriers
- job satisfaction / dissatisfaction and reasons

Transition between training and working:

- recall the first day of work (if NPA)
- how well prepared were they? Did they have to adjust?
- what do they wish they knew then, that they know now?
- what is it like working with a newly qualified NPA (for non-NPAs)?

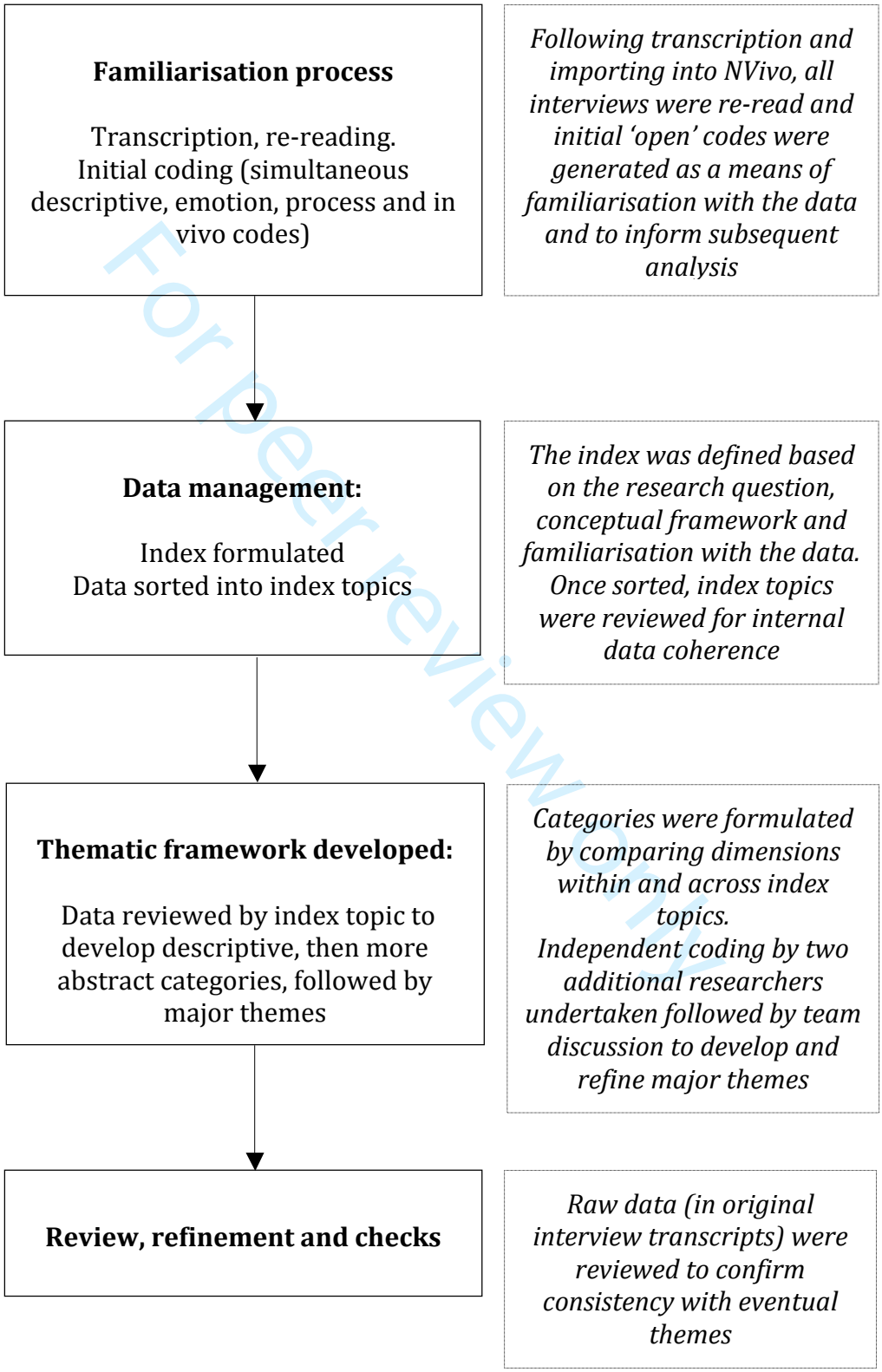
Physician and non-physician anaesthetists (if not already covered)

- Experience working together during NPA training?
- Experience working together after training?

Aspirations:

- How would you change NPA training and why?

## Coding/analytic strategy



The following tables show the index topics used for early data management and the distribution of coder:source.

Table 1: Index created for data management

| Index topic | Index subtopic |
|---|---|
| 1. How current training is delivered | 1.1 Getting into training<br>1.2 Training structures<br>1.3 Experiences in training<br>1.4 Trainers |
| 2. Transitioning to practice | |
| 3. Working after training | 3.1 Doing the job<br>3.2 Referral and supervision<br>3.3 CME and career development |
| 4. Relationships across cadres | 4.1 NPAs and PAs<br>4.2 Surgeons and NPAs<br>4.3 Other NPA cadres |
| 5. Aspirations | |
| 6. International interactions | 6.1 International involvement in training<br>6.2 Countries as comparators<br>6.3 Other |

Table 2: Coding personnel

| Coder | Transcripts coded |
|---|---|
| LB | SL1-2, S2, U1-5 |
| FB | SL1-3, S1-4, S6 |
| HE | SL1-3, S1-6, U1-6 |
| SKI | SL3, S1, S5, U4-6 |
| VT | S3-6, U1-3, U6 |

## Recruitment flow and participant characteristics

Table 3: Recruitment by country

| | Sierra Leone | Somaliland | Uganda |
|---|---|---|---|
| Approached | 9 (3N, 2P, 4S) | 8 (7N, 1S) | 8 (5N, 2P, 1S) |
| Declined | 1 (1S) | 0 | 1 (1N) |
| Did not respond | 4 (2N, 1P, 1S) | 1 (1N) | 1 (1N) |
| Accepted but unable to interview | 1 (1S) | 1 (1N) | 0 |
| Accepted and interviewed | 3 (1N, 1P, 1S) | 6 (5N, 1S) | 6 (3N, 2P, 1S) |

*N: non-physician anaesthetist; P: physician anaesthetist; S: surgeon*

Table 4: Gender of participants

| | Sierra Leone | Somaliland | Uganda |
|---|---|---|---|
| Male | 2 | 2 | 4 |
| Female | 1 | 4 | 2 |

One participant was previously known to the interviewer as a professional colleague. Seven were known to current or previous colleagues of the interviewer (but had no prior direct relationship with the interviewer). Seven were recruited through two or more intermediaries.

# Standards for Reporting Qualitative Research (SRQR)*

http://www.equator-network.org/reporting-guidelines/srqr/

| | Page no(s). |
|---|---|
| **Title and abstract** | |
| **Title** - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended | 1 |
| **Abstract** - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions | 2 |
| **Introduction** | |
| **Problem formulation** - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement | 4 |
| **Purpose or research question** - Purpose of the study and specific objectives or questions | 4 |
| **Methods** | |
| **Qualitative approach and research paradigm** - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale** | 7 |
| **Researcher characteristics and reflexivity** - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability | 7, online supplementary material, discussed p.20 |
| **Context** - Setting/site and salient contextual factors; rationale** | 5-6, 7 |
| **Sampling strategy** - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale** | 7-8, discussed p.19 |
| **Ethical issues pertaining to human subjects** - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues | 7, 8 |
| **Data collection methods** - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale** | 8, online supplementary material |

| | |
|---|---|
| **Data collection instruments and technologies** - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study | 8, online supplementary material |
| **Units of study** - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results) | 9, online supplementary material |
| **Data processing** - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts | 8, online supplementary material |
| **Data analysis** - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale** | 7-8, online supplementary material |
| **Techniques to enhance trustworthiness** - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale** | 8 |

**Results/findings**

| | |
|---|---|
| **Synthesis and interpretation** - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory | 9-17 |
| **Links to empirical data** - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings | 9-17 |

**Discussion**

| | |
|---|---|
| **Integration with prior work, implications, transferability, and contribution(s) to the field -** Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field | 18-19 |
| **Limitations** - Trustworthiness and limitations of findings | 19-20 |

**Other**

| | |
|---|---|
| **Conflicts of interest** - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed | 21 |
| **Funding** - Sources of funding and other support; role of funders in data collection, interpretation, and reporting | 21 |

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

**Reference:**

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
DOI: 10.1097/ACM.0000000000000388