What are the views among the key stakeholders on surgical task-shifting in Liberia?

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A thesis submitted in partial fulfilment of the requirement for the degree of Master of Science in International Health
by
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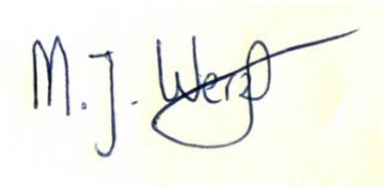

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Abbreviations

AMDD	Averting Maternal Mortality and Disability
BSMPA	Baptist School of Missionary Physician Assistants
CO	Clinical obstetrician
CUSPA	The Cuttington University School for PAs
EMONC	Emergency obstetric and neonatal care
GP	General practitioner or medical officer
INGO	International non-governmental organization
LCPS	Liberian College of Physicians and Surgeons
LMDA	Liberian Medical and Dental Association
LMDC	Liberian Medical and Dental Council
MCAI	Maternal and Child health International
MOH	Ministry of Health
MOF	Ministry of Finance
MO	Medical officer or general practitioner
NGO	Non-governmental organization
NNGO	National non-governmental organization
NPHIL	National Public Health Institute of Liberia
NTNU	Norwegian University of Science and Technology
PA	Physician Assistant
TNIMA	Tubman National Institute of Medical Arts
UNFPA	United Nations Population Fund
WHO	World Health Organization

Glossary

A.M. Dogliotti Medical College

Liberia has one medical school, the A.M. Dogliotti college.

Associate clinician or physician assistants (PAs) in Liberia

A professional clinician with basic competencies to diagnose and manage common medical, maternal, child health and surgical conditions. They may also perform minor surgery. The prerequisites and training can be different from country to country. However, associate clinicians are generally trained for 3 to 4 years post- secondary education in established higher education institutions. The clinicians are registered and their practice is regulated by their national or subnational regulatory authority. ***They are called physician assistants (PAs)*** in Liberia and community health officers (CHOs) in Sierra Leone.

Advanced level associate clinician

An associate clinician with advanced competencies to diagnose and manage the most common medical, maternal, child health and surgical conditions, including obstetric and gynecological surgery (e.g. caesarian sections). They are often trained 3 years post initial associate clinician training.

CapaCare

CapaCare is both an INGO based in Norway and an NNGO based in Sierra Leone. In 2011 they started a surgical training program for associate clinicians in both obstetric and general essential surgery. The main aim of the program in Sierra Leone is to train 60 advanced level associate clinicians called: Surgical Assistant Community Health Workers (SACHOs) by 2021 in partnership with the Ministry of Health and Sanitation (MoHS) and United Nations Population Fund (UNFPA).

Essential surgical disorders and procedures

Essential surgical disorders can be defined as those that are mainly or extensively treated by surgery, have a large health burden and can be successfully treated by a surgical procedure that is cost effective and feasible to promote globally. The disease control priorities, 3rd edition (DCP-3) describes a package of 44 essential surgical procedures (1).

Emonc training in Liberia

Emergency obstetric and neonatal care. A practical course in emergency obstetric and neonatal care, for example in obstetric surgery, for medical students at the ending of their training towards becoming a general practitioner (GP).

Liberian Medical and Dental Council (LMDC)

The Liberian Medical and Dental council is the national regulatory and licensing body of the medical doctors and dentists. The PA board is also under the umbrella of the LMDC.

Liberian Medical and Dental Association (LMDA)

The LMDA is an autonomous body which act as the national representative body of medical doctors and dentists. During quarterly meetings subjects pertaining the medical field are discussed. They coordinate closely with the Ministry of Health and the LMDC.

Liberian College of Physicians and Surgeons (LCPS)

Since 2013 the Liberian College of Physicians and Surgeons started a post graduate training program to train medical specialists. In 2019 the post graduate school had produced 13 gynecologists and 12 surgeons. Apart from that there are programs running in pediatrics, internal medicine, family medicine, psychiatry and ophthalmology.

Maternal and Child health Advocacy International (MCAI) and clinical obstetricians (COs)

MCAI is an INGO supporting the training of midwives in obstetric emergencies and surgeries in Liberia. Since 2013 they have trained 11 midwives within the field of obstetric surgery called clinical obstetricians (COs) and another 10 are in training.

Medical officers (MOs)

Medical officers or medical doctors are often referred to as general practitioners (GPs). Every county has a medical officer being responsible for the county its health care organization and leading the county health team. GPs are often involved in providing surgical services in the country.

Nursing and Midwifery Board

The nursing and midwifery board is the regulatory and licensing body of the nurses and midwives. It operates independent from the LMDC.

National Public Health Institute of Liberia

NPHIL strengthens existing infection prevention and control efforts, laboratories, surveillance, infectious disease control, public health capacity building, response to outbreaks, and monitoring of diseases with epidemic potential.

PA association and PA board

With a board of directors that would advocate for PAs, monitor and provide supportive supervision, evaluate their performance, create job opportunities, conduct capacity-building training, administer state board exams to new graduates, and issue professional licenses annually, among others functions.

Unmet surgical need

The Lancet Commission on Global Surgery recommends a rate of 5.000 surgical procedures per 100.000 population per year as a target for LMIC to achieve. A rate of 5.000 surgical procedures per 100.000 population has been associated with positive health outcomes like a higher life expectancy and a maternal mortality of lower than 100 women per 100.000 live births (2).

Task-shifting definition according to WHO

Task-shifting involves the rational redistribution of tasks among health workforce teams. Specific tasks are moved, where appropriate, from highly qualified health workers to health workers with shorter training and fewer qualifications in order to make more efficient use of the available human resources for health.

Abstract

Introduction: Liberia a country in West-Africa has an unmet surgical need of more than 90%. Training associate clinicians in surgery called surgical task-shifting is a widely practiced solution to increase the human resources for surgery. CapaCare an organization training associate clinicians in surgery in Sierra Leone is interested in expanding its activities to Liberia. This study aims to explore the different views of the key stakeholders in the field of surgery on surgical task-shifting in Liberia. Providing insight on the opportunities and challenges to start a surgical training program for physician assistants (PAs) in Liberia.

Methods: this study is a qualitative descriptive study. Key stakeholders were identified through a stakeholder's analysis and snowball sampling. A total of 30 in-depth key informant interviews were performed using semi-structured interviews based on implementation research outcome variables. Data was analyzed in NVivo 12 using deductive coding. Additionally, a power analysis of the stakeholders was performed.

Discussions, conclusion and recommendations: support from the key stakeholders is sufficient to proceed negotiations to design a program to train PAs in surgery. Key challenges identified are the reservations towards the concept of surgical task-shifting with regard to the clinical obstetricians' program, doctors' resistance and the current political economic situation of the country. Recommendations include the need for further dialogue with the key stakeholders, an institutionalized, time-bound design of the program and focus on the rural setting. There is need for salary harmonization and improvement of monitoring and regulation of a new surgical cadre. Additional support is needed for the surgical infrastructure, the anesthetic workforce and the surgical training of medical officers.

Keywords: surgical task-shifting, surgical task sharing, global surgery, Liberia [Mesh]

Preface

Nearly one-third of the burden of human disease worldwide is amenable to surgery (3). Surgery is a crosscutting intervention, at all ages, involved in every disease category. Relevant for health interventions from prevention to cure. Essential surgical procedures rank among the most cost-effective of all health interventions, similar to many vaccines and oral rehydration therapy. Currently, there is increased global interest and effort on improving access to essential surgical care in low and middle-income countries. Recent examples of those efforts are: The Lancet Commission on Global surgery and the fact that the World Bank devoted an entire volume to global surgery in their third edition of the Disease Control (4).
It is estimated that 5 billion people lack access to safe and timely surgery (2). Lack of human resources and geographical maldistribution are two main factors contributing to the lack of available surgical and obstetric emergency services (5)(6).

As a doctor specialized in Global Health and Tropical Medicine (7) I worked from 2016-2019 in a 70-bed rural hospital in Sierra Leone. Apart from many administrative and clinical duties I was trainer within the CapaCare surgical task-sharing program training associate clinicians in surgery. There I experienced how motivated and capable the enrolled students and graduates were. I believe they are of great support towards the medical officers (MOs) and even myself I noticed improving my surgical skills when working with them. With only a few doctors in the country, to me, the need to train additional associate clinicians in surgery is obvious. In 2017 I joined CapaCare and visited Liberia. The Ministry of Health (MOH) of Liberia showed interest towards the idea of training associate clinicians called physician assistants (PAs) in surgery in Liberia. Though, they proposed to perform more research on the topic first. Therefore, the Norwegian University of Science and Technology (NTNU) performed a study on the status of the unmet surgical need in the country (8). This study will focus on the views of the key stakeholders on surgical task-shifting. Providing insight on the opportunities and challenges to start a surgical training program for PAs in Liberia.

Background

Study setting and description of study population

Liberia is a country in West-Africa of 4.5 million inhabitants. A decade long civil war ended in 2003 in which many medical officers (MOs) migrated leaving a fragile health system behind. Between 2012-2014 the country was hit by the Ebola epidemic and currently the country its political and economic situation is deteriorating (9).

In 2015 the public health workforce included 117 medical officers (MOs) (0.03 per 1000 population), 436 PAs (0.08 per 1,000 pop), 2137 nurses (0.4 per 1000 pop) and 659 midwives (0.12 per 1000 pop) (10). Based on 12 sustainable development indicators the World Health Organization (WHO) estimates the need for at least 4.45 health workers (sum of doctors, nurses and midwives) per 1000 population. In 2015, when including the PAs this number of health workers was only 0.63 per 1000 population (14% of recommended) (11).
In 2017 there were 298 registered MOs in Liberia, one doctor for every 15,000 inhabitants, of which 68% is Liberian. Of those, 12 were specialist surgeons and 10 were gynecologists. There are no specialist anesthesiologists (information provided by LMDC). The minimum recommended number of surgeons, obstetricians and anesthesiologists are 20-40 per 100,000 inhabitants, which for Liberia would amount to 900-1800 specialists. Thus, the 22 registered specialists cover only 2.4% – 4.8 % of the recommended need (10).
Furthermore, MOs are unequally distributed with 61% working in Montserrado county mostly in urban areas and caring for one-third of the population (10). During the rainy season, large areas are practically inaccessible for ambulances which makes it impossible to refer patients.

Organization of training for PAs, clinical obstetricians (COs) and MOs in Liberia
Since 1958 Liberia has implemented a program for PAs. At the moment Liberia has 3 PA trainings institutions (Table 1 and Table 2). In 2019 there were 1036 registered PAs, of which 532 were actively practicing clinical medicine (source PA association). Suggesting many PAs are not practicing or not being captured as practicing (1036-532=504 or 49%). Of the group practicing 75% is working in the public and 25% in the private sector. From the group working in public sector 80% is working in primary health care and the other 20% in the hospitals.
Recently more emphasis has been laid on female emancipation. Reflected in the current numbers of female PAs being trained. The ratio female/male of the current PAs practicing clinical medicine is unknown but can be assumed to be much lower than the ratio female/male now in training.

Table 1 ratio of female PAs in training 2019

Name of PA training institution	Enrolled students (according to PA association 2019)	Females (F) /Males (M)
TNIMA (public)	81	F 21/ M 60
BSMPA (private)	40	F 25/ M15
CUSPA (private)	92	F 49/ M43
Total	213	F 95/ 118M

The table below describes the different training programs to consider when designing an additional surgical training program for PAs. At this moment the duration of the training of MOs and medical specialist is very long due to the entrance criteria of a BSc degree. Entrance requirements of associate clinicians to be trained in surgery are often related to working experience.

Table 2 relevant medical training programs in Liberia and Sierra Leone

Type of training program	Entrance requirement	Duration of training	Recognition	Total duration	Output per year
A.M. Dogliotti medical college	BSc in natural or physical sciences (3-4 years)	5-years + a 2-years internship	Master degree	10-11 years	20-40 per year
JFK hospital/ LCPS post-graduate training program	Medical officer	5 years	Specialist surgeon or gynecologist	15-16 years	2 surgeons and 2 gynecologists per year
TNIMA PA training institute (public)	Secondary school degree	3-years	Diploma degree	3-years	30 per year
BSMPA PA training institute (public)	Secondary school	3-years	Diploma degree	3-years	10 per year
CUSPA PA training institute (private)	Secondary school	4-years	In transition from diploma to BSc degree	4-years	30 per year
Training program for clinical obstetricians (COs) in Liberia (see glossary).	Midwives with at least a few years of experience (12)	3-years	Diploma degree	Depending on experience prior to start of training (+- 8 years)	1-2 per year
Surgical training program for associate clinicians in Sierra Leone. Supported by CapaCare (see glossary)	Associate clinician with at least 2-years of experience (13).	3-years	Diploma degree	8-years	5 per year

Problem statement and justification

Task-shifting

Vertical task-shifting is an increasingly applied solution to expand surgical workforce (14). Its aim is to delegate tasks from surgical specialists to MOs without specialization or to associate clinicians (see glossary). In the literature task-shifting and task sharing are often used interchangeably. Task-shifting compared to task sharing implies a greater extend of independent practice with higher coverage but questions if it can ensure provision of safe and high-quality care. Therefore, in the literature it is proposed to change the concept of surgical task-shifting to surgical task sharing with a more integrated focus of the newly established cadre within the team, with focus on competencies needed and appropriate level of supervision(15). For the scope of this paper we will further refer to task-shifting as defined by the WHO (see glossary).

In the field of task-shifting a lot of experience has been gained within the field of HIV-care. Lessons learned from task-shifting within the field of HIV-care are described by Chu et al (16). These cover the need: to define the limits, for continuous training and supervision and to have a referral system in place. Additionally, there is need for adequate recognition and remuneration, developing adapted guidelines, engagement with regulation bodies and exploring the role of the community health workers (16).

Important benefits of surgical task-shifting from MOs towards a cadre with fewer qualifications are the reduced training time, fewer employment costs and higher retention rates, especially in rural areas. It is highly cost-effective and can increase accessibility to and availability of surgical care (17) without compromising the quality and safety of care (18)(19) (19). The WHO supports the concept of surgical task-shifting in countries which face a human resource crises within the field of surgery (20)(21). Though 'Task-shifting must be implemented such that it improves the overall quality of care. It should not and must not be associated with second-rate services' according to the WHO (22).

Multiple studies, within different countries, looked at the maternal and perinatal outcomes after caesarean section comparing associate clinicians with MOs and did not find significant differences (17). A study performed in Sierra Leone confirms that caesarean sections performed by trained associate clinicians are non-inferior to those undertaken by MOs (23).

Two studies in Zambia and Malawi also assessed outcomes for general surgery and didn't show significant difference on health outcomes, like wound infections between advanced associate clinicians trained in surgery and MOs (24)(25).

A more recent study, still to be published will also show that associate clinicians are not inferior in performing surgery for inguinal hernia compared with MOs, in Sierra Leone.

In 2009, Liberia participated in a conference on task-shifting to associate clinicians in Addis Ababa.

This resulted in the development of a document in which the MOH supported the concept of task-shifting, especially within the field of maternal and neonatal health (26). Up to date, the human resource situation is believed to not has significantly changed. Maternal and Child health Advocacy International (MCAI) (see glossary) used this statement together with the data on the high maternal mortality to justify the start of a surgical task-shifting program training midwives, called clinical obstetricians (COs) to perform obstetric surgeries. In April 2019 the WHO published an external evaluation of the COs' program concluding positively about the performance on patient outcomes and cost-effectiveness (26). The report mentioned the challenge that the Liberian Medical and Dental Council (LMDC see glossary) was not in favor of training COs. The document suggests that it might be related to a lack of knowledge and data on surgical task-shifting, ignorance of the reality or generalizing standards of medical practice in the Western world to Liberia. Though the researchers did not discuss the issue with the LMDC directly.

In 2017, a team from CapaCare visited Liberia to engage with different stakeholders involved in the creation of a national surgical plan. The MOH of Liberia showed some interest to extend the concept of surgical task-shifting and to consider the idea of training PAs in surgery.
Proposed was a collaboration combining the experience from MCAI in Liberia and CapaCare in Sierra Leone. Together with the increased output of doctors and specialists, the training of more mid-level staff in surgery could improve the capacity and accessibility of surgical and obstetric services.
Experts in the field of global surgery, advised to do more empirical research on the actual gap in provision of essential surgical procedures (see glossary) before proceeding with implementation. Also they expressed the need for a context specific approach when developing a national surgical plan (27)(28).

Considering the potential of the surgical task-shifting program in Sierra Leone to strengthen the health system, the potential to reduce the surgical burden and delivering high quality surgical outcomes, a logic next step would be to explore opportunities to expand (13). For example, to roll out a CapaCare supported surgical task-shifting program in countries with a similar context, to start with Liberia. In 2018 the NTNU collected data on the unmet surgical need in in Liberia comparable to the work done in Sierra Leone (29). Results show an overall unmet surgical need (see glossary) of more than 90%, even higher in the rural areas (8). Previous data on the met and unmet surgical need in Liberia is outdated and only focusing on hospitals in a rural setting (5).
This research explores the different views on surgical task-shifting among the key stakeholders within the country. This in order to obtain a better understanding of the context of Liberia; providing insight on the opportunities and challenges to start a surgical training program for PAs. Additionally, to advice the MOH of Liberia and CapaCare whether or not to extend surgical task-shifting by training PAs in surgery.

Acceptance of surgical task-shifting in Sub-Saharan Africa

Surgical task-shifting is widely practiced both formally and informally (18). Research is mainly focusing on results from East Africa. Recognized international organizations like Médicines Sans Frontières, International Red Cross, have supported surgical task-shifting initiatives in various resource limited settings (16). A large study in Uganda looked at the reasons for justification and the perceived effects of surgical task-shifting. They found that surgical task-shifting was largely supported by facility managers and frontline health workers. Main reasons for justification were: understaffing, 'to save lives', and additional benefits for health workers like additional skill and income. 'Leaving an incompetent trainee unsupervised' was one of the main perceived risk of task-shifting (30).

Another study in Mozambique describes a context wherein formal surgical task-shifting already exists since 1984. They describe that initial doctor resistance existed and consisted of perceiving the newly cadre as second-class professionals, leading to a lack of consideration and commitment in pursuit of their training. Nowadays, 90% of the doctors support their work. Reasons for this are the associate clinicians to have higher retention rates in the district hospitals compared to doctors and studies to have proven their up to standards quality outcomes (31).

Ashengo et al. describes physician resistance as one of the main barriers to safe and effective task-shifting (18), in which perceived safety and quality, power dynamics and ethical considerations play an important role. A study in Zambia emphasizes on the way MOs feel alleviated by the coming of advanced associate clinicians trained within the field of surgery. They increase the surgical volume, lead to less referrals and even full fill a role in training of the less experienced MOs in the field of surgery (32). Challenges as described were the low recognition of the newly established cadre and limited opportunities for career progression. A qualitative study exploring the relations between the associate clinicians trained in surgery and MOs in rural Sierra Leone, found that the cadre was highly appreciated by the MOs, relieving them from their surgical responsibilities and seen as highly competent. Because the associate clinicians trained in surgery were often left performing their job unsupervised especially in rural hospitals it suggests surgery to be an under developed medical domain in rural hospitals in Sierra Leone.

Otherwise, the newly created cadre did not feel recognized and were not seen as 'equal' by the MOs. The surgically trained advanced associate clinicians were considered as a cadre 'in between' associate clinicians and the MOs. Leaving them sometimes unmotivated or trying to show their worth by performing task beyond their jurisdiction (master thesis Rasmussen 2016) (33).

Additional considerations

When looking at the potential of surgically trained advanced associate clinicians it is clear they theoretically could decrease the overall surgical burden of a country with limited surgical human resources (13). After a few years of implementation of a surgical task-shifting program for advanced associate clinicians a study in Sierra Leone found a very low surgical productivity per surgical provider (34). Another study in Zambia found an increase in surgeries in the hospitals where the surgically trained associate clinicians were working but a decline in the control hospitals where only MOs were performing surgeries (24). It could be hypothesized that in a country with only limited MOs and an emerging new cadre within the field of surgery could leave the MOs shift their attention towards other medical and managerial tasks outside the field of surgery. On the other hand, surgically trained advanced associate clinicians will shift their focus from other clinical tasks towards surgery. The number of associate clinicians in Liberia is limited (10) therefore prior to training them within the field of surgery, the question should be answered if training them in the field of surgery would not compromise other fields of medicine in which they are active?

Therefore, it must be clear that a combination of interventions is necessary to reach the goal of meeting the unmet surgical burden without compromising other aspects of the health care system. Task-shifting is not a solution to a dysfunctional system but needs to be supported by other health system strengthening efforts (35).

Gap of data within the literature

Most research on surgical task-shifting originate in East Africa. Situation analysis and stakeholder analysis of the West African health care system related to surgery is scarce. Therefore, engagement with the key stakeholders involved in surgical task-shifting should be undertaken to understand the current situation in Liberia.

Purpose statement

Justification

The concept of task-shifting to safely expand the surgical workforce is supported by the WHO (20). We want to look at the different views among key stakeholders on surgical task-shifting in Liberia. The results can provide valuable information, within the theoretical framework (see further), and considerations prior to designing of a surgical task-shifting program targeting associate clinicians (PAs) in Liberia.

Objectives

- To map the key stakeholders in the field of surgical task-shifting in Liberia
- To map the different views on surgical task-shifting among key stakeholders in Liberia
- To identify the perceived barriers and enabling factors to the introduction of a surgical task-shifting program focusing on PAs in Liberia. Considering power relations and influence of different stakeholders.
- To provide insight on the opportunities and challenges to start a surgical task-shifting program for PAs in Liberia. Providing policy considerations for future task-shifting programs in Liberia (to both MOH and CapaCare).

Methods

Theoretical framework

Different studies as described earlier have shown surgical task-shifting to be one of the solutions to expand the surgical workforce with the aim of safely decreasing the overall surgical burden. In this study we explore the different views of key stakeholders in Liberia on surgical task-shifting in order to map perceived barriers and enabling factors that need to be considered before implementing and scaling up surgical task-shifting initiatives focusing on PAs. Results of this study could be used to guide decision making and development of a tailored made task-shifting program in Liberia.
Therefore, this research falls within the field of implementational science. Although there are several definitions of implementational research, the WHO Alliance for Health Policy and System Research (AHPSR) defines implementational science as follows: the scientific study of the processes used in the implementation of initiatives as well as the contextual factors that affect these processes(36).

The research papers of Procter et al. have summarized the most important outcome variables for the successful implementation of an intervention, new treatment or policy within a framework for implementation research (37)(38). See for definitions of the outcome variables table 3. Although this study does not assess the direct outcomes of implementation it will study the views of the stakeholders with regard to the different outcome variables. As discussed by Proctor et al. the different outcome variables are overlapping (37). For example, in some studies acceptability and appropriateness are used interchangeably, though, an intervention can be appropriate but not acceptable by the key stakeholders and vice versa.
Feasibility is the extent to which an intervention can be carried out successfully in a particular setting; for which a certain degree of acceptance by the key stakeholders and appropriateness will be necessary. Costs are also important to consider, as we know expensive but effective interventions will not be feasible within the setting of low resource countries. See figure 1; to understand overlapping outcome measures.
This study will be complementary to the study recently carried out to measure the unmet surgical need in Liberia(8); quantitatively looking at coverage within the conceptual framework. Therefore, in this study coverage will be evaluated to a lesser extend as the results of the first study showed the unmet surgical need is extremely high in the entire country (8).
Perceived views on fidelity; defined as to which degree an intervention was implemented as it was originally planned will cover initiatives that are already implemented before and lessons to be learned from the program training midwives in surgery in Liberia. Adoption will be described as the perceived support towards the start of surgical training program for PAs within the stakeholders' analysis (Table 4). The outcome measures will be used as the themes to be discussed during the interviews with the different stakeholders.

Implementation outcome variable	*Definition*	*Key words*
Acceptability	The perception among stakeholders that the intervention is agreeable	Comfort, advantage, credibility
Appropriateness	The perceived fit or relevance of the intervention for a particular setting or audience	Perceived relevance, fit, usefulness, suitability
Costs	Costs depending on complexity of intervention, strategy and setting	Marginal costs, total cost
Feasibility	The extent to which an intervention can be successfully carried out in a particular setting	Practicality, actual fit
Sustainability	The extent to which an intervention is maintained or institutionalized in a given setting	Maintenance, continuation, durability, integration, institutionalization
Adoption	The intention, initial action or decision to try to employ a new intervention	Uptake, utilization, willingness to try
Coverage	The degree to which the population that is eligible to benefit from an intervention actually receives it	Reach, access, penetration
Fidelity	The degree to which an intervention was implemented as it was designed in an original protocol, plan or policy	Adherence, delivery as intended, integrity, quality of program delivery, intensity or dosage of delivery

Table 3. Implementation research outcome variables

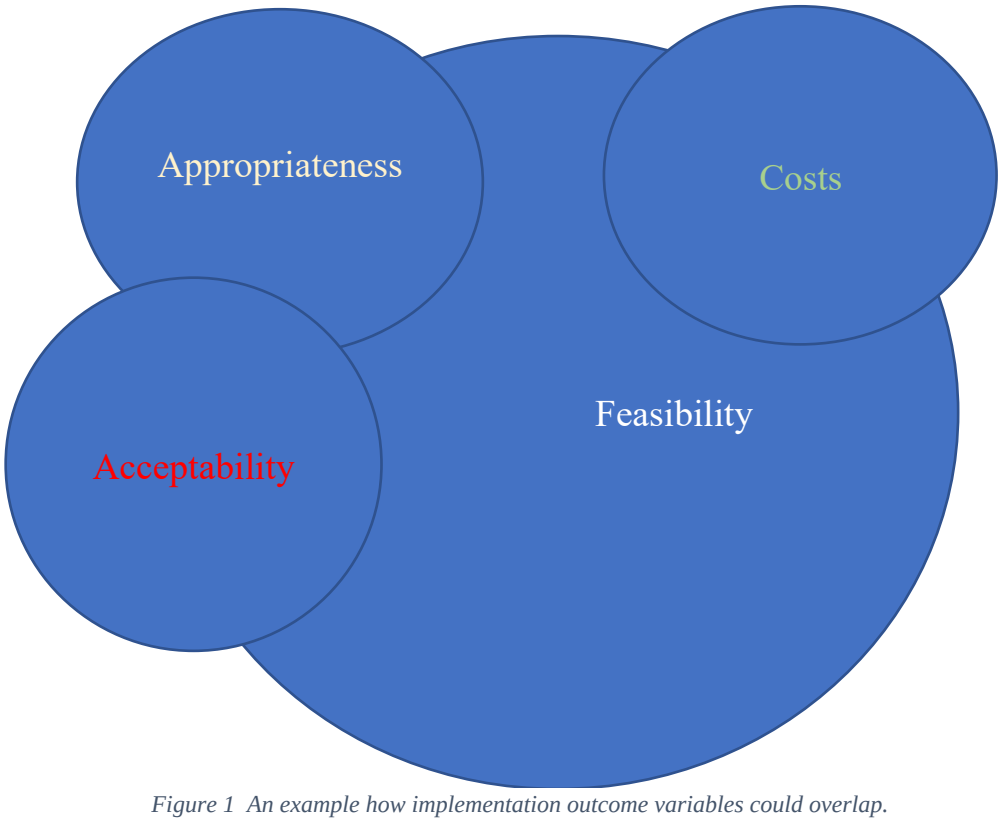

Figure 1 An example how implementation outcome variables could overlap.

Study design and data collection

This study is a qualitative descriptive study. It describes the views of key stakeholders on surgical task-shifting in Liberia. Relevant stakeholders were identified through a brainstorm session and stakeholder analysis. Input was requested from the research team of the NTNU that performed the study on the unmet surgical need in the country (8) and from CapaCare. The MOH of Liberia was also approached to deliver input on stakeholders to be included. The WHO guideline on stakeholder analysis was used and adapted in order to identify the key stakeholders (39). The stakeholders were inputted within a stakeholder matrix in which level, sector, position, power and influence on the implementation process were stated (see Annex 2). After completion of the study the stakeholder analysis and power relations were analyzed (Table 4 results).

To interview key informants, we used semi-structured interviews; guided by themes distilled through a combination of literature identified, discussion among the research team and the theoretical framework. The general format of the semi-structured interview guide was pretested with the local counter part of the research team for general understanding within the Liberian setting and was posed in English. Interviews were done by a medical doctor specialized in Global Health and Tropical Medicine. The local team member joined to facilitate logistics and interpretation. Daily debriefing discussions were hold within the team. Interviews were recorded and transcribed. Interviews lasted from 20 minutes-1.5 hours depending on the input of the participant.

Sampling

The qualitative sampling was purposive and cover the previously identified stakeholders. Additional stakeholders were identified through snowball sampling.

Patients and the community, although an important stakeholder were not interviewed as their power and influence on the initiation of a surgical task-shifting program is considered to be limited. From the CapaCare surgical task sharing program in Sierra Leone we already know that it is accepted by the patients to undergo surgery by a cadre with fewer qualifications than MOs. The opinions from the PAs were considered as they will be the ones who will have to embrace the program and be willing to enroll. Additionally, they have a lot of knowledge on the Liberian health care system.

After the brainstorm session to identify stakeholders the research team proposed to engage first with healthcare workers, in order to capture as much as data possible before interviewing the policy makers. Because of planning of the interviews this was not always possible. The final sampling

protocol is shown in figure 2.

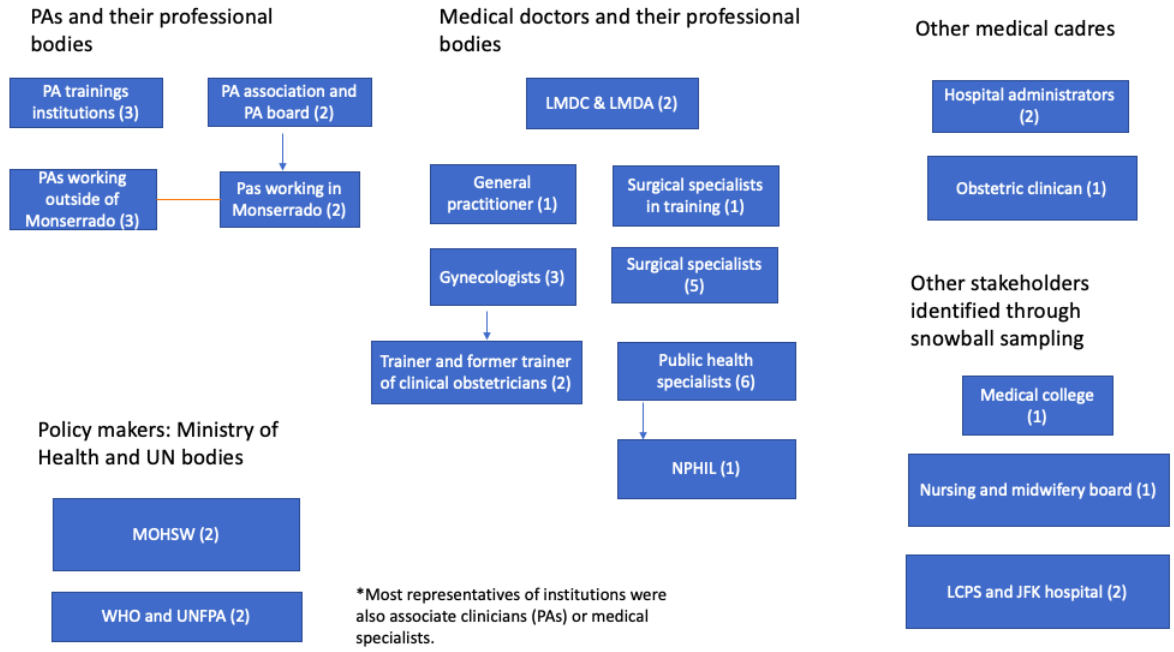

Figure 2. Purposive sampling protocol of the key stakeholders interviewed (n=30).

Analysis

The qualitative data was analyzed using deductive coding. The deductive codebook was developed prior to analyzing the qualitative data and was based on the themes as described within the semi-structured research guide (Annex 3). All transcriptions were coded using NVivo 12. The research guide was compiled using the literature described, discussion within the research team and the theoretical framework. A power analysis of the stakeholders was conducted in order to understand the dynamics between the different stakeholders and their possible power and influence on the implementation of a surgical task-shifting program targeting PAs (see Table 4 results).

Planned dissemination: to whom and how?

This study is part of Master thesis in International Health. Results will be disseminated through a written report with both the MOH of Liberia and the CapaCare team.

Ethical considerations

The medical ethical research board, UL-PIRE-IRB, in Liberia granted ethical clearance for this study on 10-10-2019, protocol number: 19-10-180. Additional medical ethical clearance was requested and granted on 11-10-2019, number S-110, by The Royal Tropical Institute (KIT) as Institutional Review Board.

All participating stakeholders provided written consent prior to the interviews (Annex 1).

Methodological study limitations

The initial idea of the study was to include an equivalent of healthcare workers practicing in hard to reach areas comparing their view to healthcare workers practicing in urban areas. This was not practically possible due to poor weather conditions and bad roads during the study period. Still, many participants interviewed were experienced with working in rural conditions before. Not all stakeholders identified could be interviewed, for example USAID was identified as one of the major funding agencies in Liberia but an appointment could not be scheduled within the timeframe of the research schedule. Coding of the research data was only done by the lead investigator therefore certain codes could have been missed or were not compared between several researchers. This was due to capacity restraints of the primary investigator.

Results

Key stakeholders identified

Participants were asked who they perceived to be the key stakeholders in the field of surgery or to consider when starting a surgical training program for PAs. The most often mentioned stakeholders were: The MOH, the MOs and more specifically the surgeons, the Liberian Medical and Dental Association (LMDA), LMDC and the PAs. Additional relevant stakeholders identified through the process of snowballing were: the AM. Dogliotti medical college, the LCPS, the MOF, nurses, lawmakers and USAID. Apart from the above mentioned, multiple other stakeholders were also mentioned, but considered less relevant (Table 4).

Acceptability

The idea of starting a surgical task-shifting program for PAs was supported by a majority of participants. All PAs interviewed were enthusiastic as this would give them new career opportunities even though all PAs interviewed were actively practicing already. By various stakeholders it was described that PAs were often not deployed, not paid or not paid on time. The unemployment rate of PAs was estimated to be between 30-40%, by the representative of a PA training institution and the representative of the LMDC. The high unemployment among PAs was one of the key reasons for stakeholders to support the idea of giving them additional skills in surgery as described below.

"I think, for me it is okay [..], ehhm, in Liberia right now physician assistants do not have a career ladder, they are trained generally and after training they should really be assigned in rural health facilities where they can be there to support where medical doctors cannot reach. Ehhm and right now we even see even after training it is also a challenge for government to employ them to go to those areas and we find out that because of this frustration many of them are turning into other professions." (Representative of a PA training institution)

Multiple suggestions were made by stakeholders to integrate the new surgical training program within their institution, e.g. by the LCPS and PA trainings institutions. UNFPA and WHO showed both interest into the idea of training PAs in surgery. A first level rural hospital was offered to function as a training facility for the program.

The LDMC and LMDA had reservations in relation to lessons learned from the current surgical task-shifting program for COs (see section fidelity and Table 5) but were not against the idea of surgical task-shifting per se.

Acceptance by the MOH

Multiple stakeholders within the MOH were interviewed. Overall the MOH was perceived to be supportive towards the idea of training PAs in surgery. One important MOH representative though was not in favor. One of the reasons not to support the idea was the thought that the lack of human resources for surgery is not the main challenge of the surgical healthcare system but surgical infrastructure is (see also doctors' resistance). Another challenge described were the weak financial resources of the government in order to absorb the program within the government budget (see below heading costs).
It was mentioned that using a low doctor to population ratio as argument to train PAs in surgery would not be appropriate as many medical tasks are already shifted to nurses and PAs. Therefore, these cadres should be included in the doctor to population ratio.

"I mean, I think that the physician assistants have major, personally I think they have so much to do. There is a strong primary healthcare service. We need to build their capacity to effectively efficiently deal with primary health care service, especially looking at non-communicable diseases looking at tropical diseases, malaria and other cases and so forth. [..] So, I think their capacity needs to be built but more into providing more clinical care. Then going into surgery." (representative of the MOH).

Doctors resistance

The main challenge described by almost all participants was the resistance and expected resistance from the MOs against the start of a surgical task-shifting program for PAs. For a comprehensive list of reasons for doctors to resist the start of a surgical task-shifting program for PAs see annex 4.

Resistance against PAs in general by doctors was described by a PA as not being a new phenomenon:
"I don't know what the fear is but the very training of PAs in Liberia was brought by the doctors themselves.[..]"
"And some doctors saw the PA training program as a direct threat, if they continue to train these people, we will not have access to patients[..]." (PA working in Monrovia).
The fear that patients and thereby salary would be taken away by a newly trained cadre was an often-heard argument.

Another concept causing friction among the two cadres was the perceived lack of respect for the nomenclature of MOs:
"Most of the physician assistants you understand like generally they call them doctors. So that is

a very big problem between the physician assistants and the normal GPs. [..]" (Hospital administrator working semi-rurally).

By a representative of a PA training institute caution was expressed as further resistance of MOs against a new surgical training program for PAs could widen the gap of acceptance of PAs in general. **"And if it is pushed, and the doctors don't want it, if it is being pushed by the PAs that would widen the gap. Because they would be destructive towards the PAs for them that is a concern."** (Representative PA training institution).

A representative of the WHO described the factors leading to doctors' resistance to be able to be divided in two groups. One group of doctors being genuine willing to control the quality of the whole and the other group willing to protect their own territory.

From all interviewed for this study four participants were clearly against the concept of starting a surgical task-shifting program for PAs in Liberia. The LMDA and LMDC had reservations but were open to consider the idea if properly executed (Table 5). All four opposing participants were doctors: a public health specialist, a surgical specialist in training, a gynecologist supporting the COs and a surgical specialist.
The main argument that was put forward was that human resource is not the most pressing challenge of the surgical health care system but surgical infrastructure is; like suitable hospitals, theatres and equipment. Output of the medical school has been increasing steadily and specialists' surgeons and gynecologists are being trained.
On the other hand, government was criticized of not paying the doctors sufficient or on time leaving the doctors unmotivated to take their (rural) assignments. Also, quality considerations were expressed (see heading quality considerations) and the idea that surgeons and MOs are better qualified compared to PAs to do the job.

"The most important thing is the tools, not the manpower, the medical school is producing over 30 doctors every year. And those 30 doctors are supposed to take assignments and residence in these counties, after the internships." (Surgical specialist in training)

A public health specialist argued that first all other problems like paying doctors sufficient, and providing the proper surgical infrastructure should be tackled first, in order to see what gap would be left to support the need to train additional associate clinicians in surgery.

He also argued that lower salaries or expectations are no proper arguments to start a surgical task-shifting program for PAs.

“I'd say that maybe they require less, maybe salary or the expectations will be less. But that isn't where you are going you want to get the best out of what you can get. You shouldn't deploy. You shouldn't take advantage of them because they are no doctors.” (Public health specialist)

Other enabling factors

The argument that was frequently heard was that Liberia still doesn’t have enough doctors especially in the rural areas. With a fast-growing population, the need for doctors would continue to increase and therefore there would be a need to train additional midlevel clinicians in surgery. It was also suggested that because of the hardship the doctors endure and the low salaries they receive it would cause brain drain and the doctors to leave the country to find greener pastures.

It was often emphasized that the new surgical cadre will be there to support the MOs and would not be there to replace them.

Also, the collaboration between the doctor and trained mid-level clinician in surgery was often described as the doctor now being able to concentrate on the more difficult or specialized cases and relieving them from their very high working pressure. It would also give the MOs the possibility to go into the post-graduate program. As they now have the possibility of advancing themselves within the postgraduate program there would be no need for any tension among the two cadres.

Another argument made was that surgical task-shifting is already proven scientifically and that CapaCare would come in with a lot of experience from Sierra Leone.

It was also said that to have somebody provide the services would always be better than to have nobody perform the services.

“But in the absence of anyone where you have no one is better to have someone. I cannot, it is easy to sit here in my comfortable office with AC and I say, oh no, it's not fair to have, you only should have surgeons and patients are dying.” (Medical doctor and representative of the JFK hospital).

Another idea that was posed was that PAs are closer to the community and seeing more patients and therefore would pick-up more surgical cases that need attention compared to the MOs.

“And then it’s also since they are the ones who are in large numbers and interacting with patients all the time they may be able to pick cases that they would have overlooked in the past because of their level of training that they would have missed and those are some of the benefits” (Gynecologists)

Quality considerations

Multiple participants considered surgery to be ‘an art’ and considered outcomes of surgeries to be the same for MOs and surgeons compared to PAs if trained in surgery. By some participants it was even proposed that PAs who would be trained formally and thoroughly could deliver better outcomes compared to MOs who previously were not formally trained in surgery. Additionally, many participants perceived the curriculum of PAs as a good base to further progress in surgery.
On the other hand, there were participants who expressed their reservations saying surgery not only to be a mechanical thing of cutting but is also about understanding for example the physiology, pre-op management, resuscitation and the need for the surgical provider to be able to handle their own complications and that doctors are better trained for that.

“And that would help for him or her and the patients, so that that that would be a one-way but this would be for a short time because obviously, right now our PAs have only a diploma. They don't have a BSc. So, the basic there's a big knowledge gap and there's a difference between a mechanic and an engineer, so you cannot ask a mechanic to do what an engineer supposed to do. You can expect there will be complications.”
(Pediatric specialist)

Another surgical specialist stated that training these people properly, who are now going beyond their limits, and give them the skills and knowledge to perform surgeries adequately would reduce complications and therefore complications seen by surgical specialist in Monrovia.

“If they are given good training you know it will give good result but it’s kind of a bit political to compare the two groups because they don’t have the same training.” (Gynecologist)

The question was also raised that it would be depending on which procedure would be taught and depending on evidence-based evaluation available from a similar program in Sierra Leone. It was also suggested that the program should start as a pilot and the outcomes of the surgeries should be assessed in order to decide whether or not to continue with the program. It would also be important to know how exactly the curriculum would look like and who the trainers or supervisors would be and to consider their qualifications. After training it would be important how the candidates would be assessed before receiving their qualifications.

Organization of supervision

There were many different ideas of how PAs trained in surgery should be supervised and how this could be organized. Different levels of supervision were proposed such as: direct supervision and observation, indirect supervision with a physician in the neighborhood, indirect supervision with the possibility for advise by telephone or internet and the PA being able to operate independently with the possibility for supervision of the outcome on a later moment.
Another form of supervision proposed by some participants was the idea and the need for medical audits by the county health team or the LMDC in order to make sure the skills and outcomes of the mid-level surgical cadre would be monitored. From the participants interviewed and involved with the COs it became clear this cadre was mostly supervised indirectly with a physician in the neighborhood but not always being present in the hospital. Most participants supportive towards the program expressed the need for direct supervision during the time of training but the need for the new cadre to operate independently after graduation as there would not be necessary capacity for more direct supervision.
Some participants expressed their reservations towards the idea of leaving them to work independently as described under quality considerations.

"If you are trained and you practice that over and over, in the presence of a doctor, you can be independent now, you can do it, yeah. [..] Because you can't go single handed as a physician assistant you also need an anesthetic nurse and rest of the team. You can do an independent job but you also be supervised after that, you know, after." (PA working semi-rurally).

Various stakeholders expressed the importance of working as a team; in order for the doctor to partake into the program and limit the resistance. The degree of supervision of the surgically trained PA would than depend on the relationship with the doctor and the trust of the doctor in the PA.

A description of an opinion on the situation without a medical doctor being around.
"No you operate because you are trained to do surgery, you are not trained to refer surgery. Because you are referring to somebody who is a GP, maybe you know more than the GP you are sending to. The only reason is you collaborate with your GP in your hospital because you are working as a team. You understand." (Surgeon working semi-rurally)

Fidelity

Lessons to be learned from the clinical obstetricians (COs)

In October 2019, during the time of conducting the field work for this study it became clear the surgical training program for midwives was being heavily criticized by various stakeholders. Before the start of the program in 2013 there was a stakeholders meeting in Bomi county. Some stakeholders said that 'consensus' to start the program was reached but others criticized this argument by saying not all major stakeholders were part of that meeting. It was said that a recent request to plan a new stakeholders meeting was placed on the desk of the MOH.

"Yeah because if they had that consensus, yeah but you have a stakeholders meeting, but who are the stakeholders that were there? You know..who are the stakeholders? (LCPS representative)

The first two graduates were supported and licensed by the LMDC as COs.
In 2018 leadership of the LMDC changed and the current LMDC leadership refused licensing of the newly graduated COs, arguing to not have received a proper handing over from their predecessors concerning the program. The current leadership of the LMDC argued that the decision to start the program was made on consensus by a few powerful stakeholders without the support of the MOs in general. Because of the LMDC refusing licensing of the COs the MOH in collaboration with MCAI decided to change the regulatory and licensing body of the COs towards the Nursing and Midwifery board.

"I'm so happy about the Ministry of Health because they are supporting this process. [..]So, you give it for the first class I think the second class, now the third class you cannot give it? So how does that work? So, we said okay we will take over. Because it is not the first time, the nurse anesthetist that was the thing." (Nursing and midwifery board representative).

"We raised issues about it because the doctors were concerned. Why are we, what is it LMDC doing, why do we have a post medical graduate school? We have Emonc (see glossary) programs, we have interns, we have doctors coming from abroad. Is there a need for us (referring to medical doctors) to really have this training program in place? The ministry has not been able to answer that." (LMDC representative).

Another argument was that the COs were taking the cases from the intern doctors when working in the same hospital. It was described that in some instances this created tension as some COs in training were already able to perform some procedures independently and the intern doctors were just coming

in and needed more direct supervision. A representative from the medical college described that they were in the process solving the issue by reorganizing the training of MOs in order to have them trained in surgery before having them interact with another surgical cadre.

Additional critique comprised of the argument that salary for the COs was not properly arranged and is not embedded within the salary framework of the MOH. It was said by the LMDC representative that COs were making a salary comparable to intern doctors. Also, it was criticized that there hasn't been any legal act passed into law leaving the program without any legal mandate.

The program was also criticized for not having an independent assessment of the candidates and doubts were expressed whether there is an independent curriculum available.
"Because the same people doing the training, but the same people doing the assessment the same people are given the exam. So, we saw that it was not fair [..] Do they have a syllabus? Besides that, can another group replicate that syllabus and get the same result?" (Representative of the LMDA).

Another lesson learned from the CO program is that it is an additional three years of training for a midwife without earning a BSc degree. Therefore, institutionalization into an existing university program needs to be looked at and was proposed by various stakeholders including the LMDC and LMDA. Other reasons not to support the CO program was that it was perceived as not cost-effective. It was said that the costs of the program were too high and with similar costs a surgeon could have been trained. It was also observed that COs deployed rurally sometimes didn't perform many surgeries, just a few in a couple of months, and would therefore not be cost-effective.

On the contrary some stakeholders made arguments in order to defend previous statements. And it was suggested that the resistance against the program was highly political. It was suggested that possibly the reason for this is the current plan of extending the program of COs in the near future.
The argument was made that the resistance was solely against the COs and not for example against the nurse anesthetists or the nurses that are trained to perform cataract surgery.
"They (MOs) trust a nurse to operate an eye, but you don't trust somebody to make a big abdominal incision and take out a baby. You know, I mean I would rather give you the knife to do a cesarean section quickly to give you the knife to work on my eye, you know, yeah but, so it is that kind of a paradox that we have." (Surgical specialist).

Another argument supporting the program of the COs was made by one of the surgical specialists heading the evaluation of the COs' program. He stated that one additional effect of the program was

that the cesarean section rate didn't increase because of increased attention to try to deliver the women vaginally or with vacuum extraction.

Appropriateness

PAs versus midwives

Different participants made arguments why PAs or midwives would be more appropriate to be trained in (obstetric) surgery. One of the key opinions described by especially the supporters of the COs was that maternal mortality is rising in Liberia and should therefore be prioritized. Midwives have a curriculum that focuses more on obstetrics compared to the curriculum of the PAs and are therefore better in handling obstetric emergencies.

"I have never thought of physician assistants, to be incorporated into a program, because I always saw them as screeners, those that I worked with, you know there are few that are very very very qualified as screeners but I always saw them as screeners. And ehm plus thought about task-shifting you know the main issue in Liberia is maternal mortality with over a 1000 death per 100.000 live birth, so, I believe midwives, nurses they are more involved, [..], for me they should be the key actors in task-shifting, well maybe my understanding is bad or so I don't know." (Gynecologist and trainer of COs)

A few participants mentioned to have the experience of PAs not being eager to attend to obstetrical cases or function more as 'screeners' within the hospital system. On the other hand a PA working at a training side for COs complained of not being allowed to admit patients or do ward rounds. The PA association and PA training institutions didn't agree that PAs would not be suitable to be trained in obstetric surgeries. According to them obstetrics is an important part of the PAs curriculum.

Procedures to be included within a surgical training program for PAs

In general participants agreed that the training of PAs in surgery should focus on life saving or emergency procedures most frequently encountered. Some of the mentioned procedures were obstetrical emergencies like cesarean sections, placenta removal and D&C. For general surgeries; hernia surgery was most frequently proposed. For more specialized procedures like laparotomies, hysterectomies, bowel resection and anastomosis there was a division whether or not it would be appropriate to support training PAs into these areas. The supporters of this idea thought it fit as it would be necessary especially in the rural settings in order to prevent delay in referral with the absence of a national ambulance referral system and bad roads especially rurally.

"But I don't see the reason why a woman should die just because of a retained placenta, I don't see the reason why a woman should die because of a ruptured ectopic. If you have trained a mid-level health worker to save that life.[..]" (Gynecologist).

Other complementary necessary health workforce

Most stakeholders agreed that Liberia has a large shortage of anesthetists. At the moment there are no physician anesthesiologists in the country. Examples were given of rural hospitals not being able to perform surgery because none were capable of performing anesthesia. Anesthesia is provided by nurses trained at Phebe hospital. The output from the training school is less than 10 anesthetic nurses per year of which most are believed to be found in the urban areas. At the moment a few physicians are sent abroad to do their specialization in anesthesiology. There is a plan of the LCPS is to start a postgraduate specialization for anesthesiology once these doctors return from their postgraduate training abroad.

It was also proposed by a PA that PAs trained in surgery could also play a role in providing anesthesia themselves.

Public versus private

Most of the healthcare facilities in rural Liberia are public facilities. Within the capital there are many private clinics but few providing surgeries. The bigger private facilities offering surgical services are owned by faith-based organizations. It was stated by a participant that the private sector used to be financially supported by the public sector but that this has changed over time. Nowadays the private sector is supporting the public sector.

Most participants agreed that PAs trained in surgery should, in principal strengthen the public sector, at least for the first years after graduation. It was proposed that government could decide to post a surgically trained PA within the private sector if the need would arise (secondment). Three of the PAs interviewed thought it appropriate for them, if trained in surgery to be allowed to open their own private for-profit clinic after they would have served government for an X amount of years. Another participant argued this should only be allowed if properly regulated. Other participants expressed their reservations towards private for-profit clinics as many times proper supervision would not be available in those clinics. Another argument against working in the private sector was that it could create unwanted competition. If the private sector would pay a PA trained in surgery too much he or she would never be willing to work in the public sector again.

Urban versus rural

The original mission of the PAs was to strengthen the rural healthcare system. It was described by a participant that during the war many PAs migrated to Monrovia and remained there working for

NGOs. Rurally it is difficult to find a job if not deployed by the government. If there would be a surgical training program for PAs, most participants expressed to be in favor to have them work mainly in rural underserved areas where there is a shortage of doctors and there would be more surgical cases available because of a higher unmet surgical need. Within the urban area of Monrovia it was described that there are many clinics and doctors available. It was also thought that PAs, as it was their original mission, would be more willing to accept rural assignments as compared to MOs who are less willing to work in rural areas.

It was brought up that there should be a definition of what is considered to be rural and whether or not the proximity to a larger hospital should play a role in this definition. Or whether it should focus more on the population served. As a hospital could be located in a town but catering to the rural population. It was suggested by multiple stakeholders that anyone working outside the capital or Monserrado county could be considered working 'rurally'.

Support to the rural population would also fit into the UN development agenda as described below:
"The skillset being available at the remotest part of the country is something that's part of our, the global team right now of: 'Leaving no one behind' and it is addressing the furthest first. So, this concept really supports the sustainable development goals of the UN and it's something that we think is very in the right direction and at the right time to be implemented." (UN representative).

Preferred sex of surgically trained PAs

Most participants agreed that training female PAs in surgery would be a good thing. It was mentioned that over time the ratio of female PAs has increased substantially.

"[..]Midwifery skills it is often done by women and not only that but if you look at the African setting most women tend to go to a female service provider than a male, if they have a choice. So, having them, have more females and I think is cool because it give the women even more, you know, confidence [..]" (UN representative)

Feasibility

Feasibility is the extent to which an intervention can be carried out successfully in a particular setting. It is dependent on the outcomes of all other themes discussed. Additional important factors to consider are regulation and recognition.

Regulation and licensing

Most participants agreed that the LMDC should be the overall regulator of PAs trained in surgery as the PAs would be interacting with the MOs.
Many participants emphasized that the PA board is already under the umbrella of the LMDC and therefore could regulate and license the new cadre with the LMDC overseeing its activities. Additionally, the PA-board already has experience in the regulation of task-shifters as there are PAs trained as mental health clinicians, ophthalmic clinicians and PAs who did additional training in dentistry and ENT.

The LMDC representative stated to prefer not to license the new cadre as it would be difficult **'to be the judge and the jury'** but would prefer to play an overseeing role.

It was described that initial regulation of the COs by the LMDC was done because of fear of proliferation of training programs.
"And the reason why that was proposed was the fear of proliferation of training. Because in this country it is very easy for somebody else to start some school somewhere (laughing). So, it was a control mechanism, now that we have a younger generation of doctors in the LMDC they say they are not going to do that so it is going back to the nurses." (Representative medical college).

Regulation should include monitoring of the new cadre, including acceptable outcomes of surgery and whether or not the new cadre would go beyond their limits. The current regulatory framework in place within the Liberian health system was described as being weak by many participants and the need to capacitate them was underlined. The suggestion was made that surgeons should be involved in the evaluation of the new surgical cadre for example through the LCPS. Another challenge described was the inability to monitor health care workers working in the private sector.

Recognition

As previously described one of the major arguments to start a surgical training program for PAs would be to give them a career ladder. Most participants supportive to the idea of starting a surgical training program for PAs proposed a BSc program for the surgically trained PAs. Recognition following a BSc degree would make it more easy for them to be paid accordingly. The CUSP is already transforming its PAs training program towards a BSc and suggested to include surgery as a sub-specialty next to their pediatric and obstetrical sub-specialties. Including mandatory college (BSc requirements) courses like English and mathematics would be a challenge in setting up a BSc program. Other ways of recognition proposed were a proper increase in salary and receiving appropriate nomenclature.

It was also proposed that policy should be made from higher hand that could be communicated to the people to accept the new surgical cadre.

"O yes, there has to be a policy, one is a policy from the national level then awareness will be done then the PA can be recognized from that point, I think that must be done, written into a national policy and then awareness is done and people will accept it." (Hospital administrator working semi-rurally).

Costs

The current weak economic status of Liberia was described as a challenging environment to start a new program. A PA mentioned that low salaries and high expenditure at home because of a large family and children would make it difficult for PAs within the program **'to focus on the lesson and not be distracted'**. On the other hand, it was said that an economy that is weak would not deliver much revenue for government and would limit the capacity for government expenditure towards the program.

A representative of the MOH commented on its current financial challenges and limited resources available.

"[..] We have a limited budget. So, running a healthcare service is very very difficult and I can give you a typical example last year our total budget for the ministry of health was 63 million dollars out of these 63 million dollars we only got 46 million dollars. Out of that 46 million dollars 39 million dollar went towards salary payment of health care workers. Running a whole health system was on seven million dollar that is not sustainable [..]. How do you introduce more financial burden on the very weak financial system that the government has?" (Representative MOH).

A MO suggested that as government would not be ready to financially support a new surgical cadre there should be community ownership and a financial contribution towards the program from out of the community.

Recent developments are complicating it even further as donors who previously were contributing towards paying salaries of healthcare workers in a pooled fund pulled out.

"So, the government has to now take in almost 2000 health workers so that now with the budgetary allocation to the government to the health sector instead of some of the money going towards medical supplies and so forth. We had to switch that to salary payment." (Representative of MOH).

A UN representative commented that it would be key for government to buy-in, to make the program sustainable; and to absorb the program within the national budget.
"So, I think first thing is the buy in from the government has to be very strong [..] and that makes it much easier once it is absorbed in the national budget, to keep it going for the required duration it needs, but minus that it is going to be a challenge." (UN representative).

Positive aspects related to costs and the start of a surgical training program for PAs were also mentioned. There were participants who described the training of PAs as cost-effective. Having lower salaries compared to MOs, and a shorter training period. As there would be more surgical providers, patients would not have to pay a lot for transport as they could receive surgical treatment within the vicinity of their homes. With increased supply of surgery, the possibility would arise that the price of the procedures could also decrease.

As it would be difficult for the government to contribute financially many participants proposed to present the plans to the donor community. WHO was mentioned as one of the donors historically to support the overall work of the PAs.
Proposed areas to be included within the budget of program are given in Annex 5.

Remuneration

In general participants agreed that a PA trained in surgery should earn a higher salary than a regular PA but less than a medical doctor. Liberia used to have fixed salary scales for different cadres of healthcare workers but many participants described that this is not being practiced any more in the current payment framework. It was described by some participants that government is not transparent why one person would earn more compared to another person. A PA said it would be difficult to upgrade a medical cadre in terms of salary and that it would only be possible if the political actors would agree before the start of such a program.

One way to reduce the costs for a possible donor organization that would support the surgical training program could be to have surgical students in the program that would be already working as PAs in the public sector and on government payroll.
Furthermore, it was mentioned by various stakeholders that the amount of salary often depends on the type of degree attached to it. And therefore, various participants were advocating for implementing a program at least at the level of a Bachelor degree.

Sustainability

Many previous discussed topics were mentioned as conditions to make a surgical training program for PAs sustainable. For example; acceptance and buy-in by the MOH and doctors would be necessary to sustain a surgical task-shifting program. Monitoring and ensuring safety were also mentioned as condition in order to make the program sustainable as a lack of monitoring could lead the new cadre to go beyond their limitations which would not be accepted by the doctors.
It was discussed that it would be difficult for government to fund the program and therefore it would be necessary to partner with other donors and to have funding available for reasonable time horizon. One participant mentioned funding would be needed for a duration of 10-years.
Most key stakeholders preferred a surgical training program for PAs to be time bound as a transition until enough doctors would be trained who will be able to do the job. Durations between 3 and 20 years were proposed.

The importance of institutionalization for the sustainability of the program was also a recurrent theme. Multiple stakeholders proposed collaborations during the interviews. LCPS, the CUSP PA training institution and a hospital up country all offered to integrate the program within their activities.

"[..] So, people go on implement, you know because they have the funding to implement, because they have the connection to bring in resources [..] And they have donors that can fund it for some time but now if it is not institutionalized appropriately right after you stop receiving funding that project closes. And then you have a lost, a lost opportunity you know because the cadres that have been trained already will become you know not recognized because they are not in the system. Sustainability, continuity of their activities will be something questionable." (Representative of the COs).

Other ways to make the program sustainable mentioned were evidence and policy dialogue between the different stakeholders. It was proposed that after the first years a study should be done in order to evaluate the impact of the program.

Power relations

Most participants agreed on the fact that it would be vital to have the program accepted by the MOs to let it succeed. At the moment the MOs are divided.
The importance of having influential MO benefit from the program in order to support it was described as follows:
"If I am not benefitting from this thing I will criticize it, if I am in power and I am not benefitting I will definitely criticize it. That is the spirit here, you understand, if you want the issue to succeed, everybody, everybody that needs to be involved needs to be involved. [..]More especially people who have been in power before and they left. Their colleagues have problems with them. So, these are people you have to be very careful of. So those are the challenges you will get." (Surgical specialist working semi-rurally).

He also mentioned that there are few very important doctors with a lot of power who can **'make things happen overnight'** when they are in support of the idea. It also became also clear that the doctors between themselves have a lot of power struggles relating to other issues, like their post graduate training program.

The power relation between the LMDC and the MOH with regard to the COs was described as follows:
'Oh, we called it (referring to the request to MOH to have another stakeholders meeting) just for the sake of calling it so that we say oh we are going to do it and so we do it. It must be held and actions must be taken and it must be communicated, and as you move forward, communicate with people, don't do things in isolation, for me I feel the ministry did this thing in isolation and this is why we have the kind of resistance we are having." (LMDC representative).

Apart from MOs it was also said that it would be important to consider nurses as they are also always looking for career path advancement.

"Because in this country the nurses believe that they are better trained than the physician assistants, they feel that they go for first degree and the physician assistants' program is a 3-years diploma. So, they will fight and they will tell you and they are the ones that need to take the string." (Representative of the medical college).

See Table 4 and 5 below.

Stakeholder	Power of influence	Perceived support towards program (adoption)	Possible role(s) within a surgical training program for PAs
MOH	Very high	+	Main authority and decision-making body when it comes to the start of a new medical program.
LMDA	Very high	+/-	Association of doctors, able to advocate or resist program.
LMDC	Very high	+/-	Regulatory body for doctors, possible regulatory body for PAs trained in surgery.
Medical doctors	High	+/-	Trainers and supervisors of trainees and graduates of the program respectively.
Surgeons	High	+/-	Trainers and supervisors of trainees and graduates of the program respectively. Senior authorities in the field of surgery in the country.
AM Dogliotti medical college	High	+++	Curriculum review, advocate among medical doctors, independent evaluation of the program by its public health department.
JFK hospital	High	++	Main public tertiary hospital. High influence among medical doctors. Advocate among doctors.
LCPS	High	++	Institution involved in coordinating medical post-graduate program. Curriculum review. Interested in collaboration.
USAID	High*	?	Biggest donor of Liberia.
WHO	Medium	++	UN agency important for policy making and possible (financial) support to the program.
UNFPA	Medium	+++	UN agency important for policy making and possible (financial) support to the program.
Nursing and midwifery board	Medium	+	Regulatory body for the clinical obstetricians and nurses.
Clinical obstetricians	Low	++	Midwives trained in surgery who could collaborate with PAs when trained in surgery.
Trainer clinical obstetricians	Low	+/-	Gynecologist involved in training midwives in surgery.
Hospital administrators	Low	++	Non-medical lead within the hospital management.
NPHIL	Low	-	National Public Health Institute. Curriculum review.
Ministry of Finance	Unknown*	?	Important for allocation of money towards the MOH and the program, absorption within national budget.
Nurses	Unknown*	?	Possibly willing to partake in the program.
Law makers (Senate and house of representatives)	Unknown*	?	Could play a role in creating a legal mandate to support the concept of surgical task-shifting.
Community	Unknown*	+	Advocate of the program, contributing in terms of community owner ship which could be financially or by f.ex providing housing to the surgical graduates.
Other donor organizations. PIH etc.	Unknown*	?	Delivering additional technical and financial support towards the program.

**not interviewed*

Table 4. Results of stakeholders- and power analysis

Stakeholder	Key pros and cons
MOH	Support is fragile and there is a division within the MOH when it comes to acceptance towards a new surgical training program for PAs. Pros: already supporting a surgical task-shifting program. In favor of training mid-level clinicians in surgery. Cons: perceiving surgical infrastructure as a bigger issue compared to HR for surgery. Weak financial status of MOH.
LMDA	Reservations related to the clinical obstetricians' program. Pros: not against the start of surgical training program for PAs. Cons: stating conditions in order to 'properly' implement a surgical training program. 1. Focus rurally, 2. Time-bound, 3. Institutionalization of the program.
LMDC	As described under LMDA. Additionally, there is the need for salary harmonization of the newly trained cadre before starting the training program.
Medical doctors (GPs)	Pros: Being able to focus on specialized cases. Relieving working pressure. Cons: see annex 4. and the section quality considerations.
Surgeons	As described under medical doctors.
Medical college	Pros: still low output of medical doctors. Supporting idea of training PAs in surgery. Willing to provide support from public health department. Cons:-
JFK hospital	Pros: in support of the idea of training PAs in surgery. Cons: unknown. Conditions stated: time-bound and focus rurally.
LCPS	Pros: in support of the idea of training PAs in surgery. Willing to collaborate in order to reduce doctors' resistance. Cons: -
USAID	Not interviewed
WHO	Pros: in support of the idea of training PAs in surgery. Supporting COs' program. Cons: -
UNFPA	Pros: in support of the idea of training PAs in surgery. Supporting COs' program but originally more in favor of the idea of training PAs in surgery. Cons: -
Nursing and midwifery board	Pros: in support of training mid-level clinicians in surgery. Cons: would prefer nurses to be included in the program as well.
Clinical obstetricians	Pros: in support of the idea of training mid-level clinicians in surgery. Cons: -
Trainer clinical obstetricians	Pros: in favor of training mid-level clinicians in surgery. Cons: the focus should be on reducing the maternal mortality and therefore focus on midwives and nurses is more appropriate compared to PAs.
Hospital administrators	Pros: in support of the idea of training PAs in surgery. Cons: -
NPHIL	Pros: - Cons: perceiving surgical infrastructure as a bigger issue compared to HR for surgery. Governments' weak financial status and not taking care of medical doctors by the MOH.

Table 5. Key pros and cons for the key stakeholders interviewed

Discussion

This study identified the most powerful stakeholders to be the MOH, the LMDC, LMDA and the MOs and specialists in general. Through snowball sampling important additional stakeholders were identified (Table 4) who could be engaged in the process of advocacy and program design in the future. Overall there is enough willingness from stakeholders to proceed negotiations with the key stakeholders in order to design a surgical training program for PAs. Key challenges observed were the reservations of the LMDA and LMDC with regard towards the lessons learned from the COs' program, doctors' resistance and the current political economic situation of the country.

Key enabling factors to start a surgical task-shifting program for PAs in Liberia

An important note is that the **concept of surgical task-shifting** is already **deeply embedded within the surgical healthcare system of Liberia**. As there are only few surgical specialist most surgeries are performed by MOs (8). There are PAs trained to do cataract surgeries and there is a program training midwifes in obstetric surgery. The country doesn't have any anesthesiologists' physicians and anesthesia is given by anesthetic nurses.

With a very high unemployment rate of PAs within the country, training PAs in surgery would give them **new career opportunities**. As the pool of unemployed PAs is large, a new program for PAs would not push PAs away from other essential clinical duties. Though a clearer picture is necessary to understand in what kind of activities PAs, who are not registered as actively practicing, are currently engaged with.

With a **population growth** estimated to be around 3.3% per year (40), and a **very low output from the medical and post-graduate school** at least for the coming 10-years there would not be sufficient human resources available for surgery in Liberia. Based on international defined needs for surgeons, obstetricians and anesthesiologists, Liberia would need about 900-1800 surgical providers in total. Even when including all Liberian MOs as surgical providers only 9-18% of this target would be met. As described by the WHO the **needs-based shortage** of human resources for health (physicians, nurses and midwives) is forecast to worsen between 2013-2030 with an **increase of 45%** in Sub-Saharan Africa (11).

As there are rural hospitals without any permanent doctor or only one who would like to **focus on the more specialized cases**, supporting these doctors by enabling mid-level clinicians to perform surgery seems necessary.

Surprisingly **the LMDA and LMDC** as hypothesized in the WHO evaluation report of the COs program (26) **did not oppose** concept of surgical task-shifting and are open for further dialogue.

Multiple stakeholders showed interest in collaboration with a surgical training program for PAs which could in the process lead to increased support of MOs.
Important collaborations were proposed e.g. with the post graduate program for physicians (LCPS and JFK). **Integration of the program within a PA trainings institution** was proposed by the CUSP. This could pave the way towards a sustainable program and would make it more easier to implement the program **at BSc level**.

Focus on the rural population

Focusing on the socially weak and **the people living rurally** would fit into the **sustainable development agenda of 'Leaving no one behind'** and could possible lead to a **partnership with UN donors like UNFPA and WHO** (41). Focusing the program on the rural population would also be the preference of most participants and could increase doctors' support as they would not encounter any competition from the new cadre in the main urban areas where they are mostly active.

Creating a legal mandate for surgical task-shifting in the country

Prior to the start of the surgical task-shifting program for COs **The concept of surgical task-shifting in Liberia was explored together with the Averting Maternal Mortality and Disability (AMDD) program** from the Colombia university in New York. Several visits took place by the key stakeholders and law makers to African countries already implementing surgical task-shifting; Mozambique, Ethiopia and Zambia. **No act was passed into law.**
Creating a legal mandate for the training of mid-level health workers in surgery could be suggested as a means of **ensuring and enforcing 'durable support' as there would be no way out**. This strategy could be used as a last resort in order to overrule resisting stakeholders. Caution should be expressed as it would **hamper the inclusiveness** of all the key stakeholders involved.

Key challenges

Leadership turnover within the **MOH and the LMDA and LMDC** during the process of starting the training program for COs **has evoked 'new' resistance** towards the concept of training mid-level clinicians in surgery**.** It was described that too little consideration of these new leaders' opinions- and **a lack of involving them with the COs' program** were part of the change in willingness (adoption) to accept the program.
In Liberia, it was said that important decisions are often made by a few powerful individuals and having their support is helpful in getting started. On the long run though, **the support of the MOs in general is necessary** to make the program sustainable. Therefore, consideration of their reservations and stated conditions are needed in the design of a surgical training program for PAs in Liberia. Conditions mentioned were **focus on the rural population, the need for a time bound program,**

institutionalization of the training program within a national university and salary harmonization prior to the start of a program.
As leadership changes regularly, **continued involvement of the key stakeholders** is needed by having **their buy-in from the beginning**, with continued **policy dialogue** and frequent **evidence-based evaluation** of the program.
A request for a **stakeholders meeting** to discuss **the way forward for surgical task-shifting** in the country was already pending at the time of the field work. It was consented by the MOH and LMDA/LMDC that CapaCare would be a valuable contributor and was invited to be part of such a meeting.

The process of starting a surgical task-shifting program for PAs in Liberia has been slow partly due to the fact that **CapaCare doesn't have a representative on the ground in the country**. If present, MOH in collaboration with CapaCare could organize for example plenary discussions on the proposed curriculum and program design.
The results of this study could help guide answering questions related to **the scope of practice** within the training program, whether or not **allowing graduates to work within the private health sector** and how **to align the program with the program for the COs** . **Roles and responsibilities** should be clear prior to the start **to create a framework for the program to limit the chance for competition between the different cadres.**

Doctors' resistance

Apart from professional turf protection by MOs another key challenge described by both MOs and the MOH was the idea **that surgical infrastructure was a more urgent problem** compared to human resources for surgery. How could a surgeon perform a surgery without the necessary equipment? A recent study (8) examined the availability of surgical infrastructure in Liberia for which the WHO essential emergency equipment list and the WHO guidelines for essential Trauma Care were used (42) (43). It found that there were indeed challenges with the surgical infrastructure available. As hospitals are not accredited in Liberia **there is no consensus on what standard of care with regards to surgical infrastructure is acceptable?** Now that data is available **further discussion** on priorities and solutions should start.
The evidence suggests both HR and infrastructure need to be strengthened and like multiple stakeholders mentioned '**a holistic approach'** to the improvement of the surgical health care system should be followed. Therefore, the question which challenge is more pressing: infrastructure or HR remains unanswered. **Strengthening both areas simultaneously is important as they are likely interconnected.**

Whether it would be the responsibility for a donor organization training HR in surgery to extend its focus towards surgical infrastructure is questionable as it would increase the costs for such a program. Collaboration with other donors could be considered or other ways of increasing governments' allocation of its budget towards surgical infrastructure.

The study of Ashengo et al. (18) described **doctor resistance** as one of the key challenges and **recommended to involve nursing, physician and other health provider** groups **to be involved** from the initial stages in for example **curriculum development.** Furthermore **the scope of practices** should be **clearly defined** and the program should **start as a pilot** that could be adjusted based upon the findings before widespread adoption. Another study (44) also found **doctor resistance** to be a main challenge **particularly in West Africa where surgical task-shifting is not as widely practiced** as in other parts of Africa.

Apart from considering the training of PAs in surgery, **support to the MOs and their surgical skills should be considered as they will be the trainers and supervisors of the trainees and later graduates of the program.** Nowadays they are trained in emergency surgeries through an Emonc program (see glossary) though previously they were not formally trained in surgery. The research done by the NTNU also shows **the surgical productivity per provider to be low in Liberia (**1.6 surgeries per person per week)(8). **Improving the surgical training of MOs could prevent a shift from surgical cases from MOs to PA**s as described in Zambia (see also additional considerations) (24).

Political economic situation in the country

A government representative described that recently **major donors pulled out** of a **pooled fund** to pay for health care workers' salaries and therefore the situation of the surgical health care system since the study in 2018 (8) could have worsened **as the MOH has less money available to invest in healthcare**. During the field work of the study there were signs that hospitals did not receive adequate supplies (45). As described by a MOH representative 85% (39 out of 46 million dollar) of the total MOH budget was allocated to salaries.

There are many factors, **like rising inflation and strike actions**, that show **worsening of the political and economic stability in the country**. In may 2019 donor funds were withdrawn by the government of Liberia (46). Possibly contributing to donors not willing to support the government of Liberia any longer.

Governments' expenditure towards salaries of health care workers is very high with limited space for other expenses. This could possibly explain the pressure on government **and why salaries are sometimes not paid,** leaving health care workers unmotivated.

Comparison to the situation in Sierra Leone

The example of the CapaCare program as it is currently executed in Sierra Leone would not be feasible in Liberia. Important reasons for this are that the **Sierra Leone program is not limited to the rural counties only** and the training program is **not yet institutionalized** within a national university. In Sierra Leone the associate clinicians performing surgeries include a wide scope of procedures including obstetric emergencies and major general surgeries. In Sierra Leone there is no program training midwives in surgery and therefore **less competition with different training programs** for mid-level cadres. Based on the results of this study many participants were **not in favor of extending the scope of surgeries to include laparotomies and bowel surgery** or they proposed a phased approach extending the scope of procedures after a positive evaluation of a pilot of the program. Representatives of the COs training program found it more appropriate to train midwives than PAs in obstetric surgeries. Therefore, **dialogue** with all key stakeholders including the group supporting the COs is needed **in order to find the best way to collaborate and align the different programs with each other.**

Limitations and strengths

Prior to conducting the interviews, it was presented to participants that the principal investigator was an independent researcher performing a research for a master thesis. Therefore, it may has been easier for participants to express their genuine opinion about surgical task-shifting instead of talking to an implementing party. It is a strength of this study to describe several reservations towards the idea of starting a surgical task-shifting program for PAs in Liberia as it gives opportunities to tailor a program specific for the Liberian context and describes way to overcome resistance.

A limitation of the study is that it doesn't include documentation research like curriculum review of the PAs. Documentation research could have given more guidance whether or not PAs are sufficiently trained in obstetrics.

Conclusion

This study identified the most powerful stakeholders to be the MOH, the LMDC, LMDA and the MOs and medical specialists in general. There is enough acceptance and willingness among the stakeholders towards the concept of surgical task-shifting for the MOH in collaboration with CapaCare to continue efforts to start a surgical task-shifting program for PAs.

Government support is fragile as the MOH is divided amongst themselves whether or not to support the idea of training PAs in surgery. Turnover of leadership could rapidly change the prospective. Another challenge is doctor resistance and therefore it would be key to convince doctors of the need of the program. More especially as they will be the future trainers and supervisors within the program. Ways of increasing MOs' support could be organizing additional surgical training for MOs as they were not all formally trained in surgery. Limiting surgically trained PAs to work rurally could limit the fear of loss of income for MOs working in urban areas. Providing additional support to the surgical infrastructure is necessary and perceived to be the main barrier towards surgical access in the country by various key stakeholders. As MOH budget is limited and mostly allocated towards salaries, partnerships with other donor organizations could be a way to allocate money towards improving the surgical infrastructure in the country. A holistic system focus is necessary in order to improve access to surgical care in the country.

Reservations of the MOs' professional bodies with regard to the COs' program also have to be considered. Lessons learned from the COs program are that the key stakeholders need to be continuously involved with the program and its evaluation, the need for the program to be institutionalized within a national institute, harmonization of the salaries of the surgical trainees and graduates prior to implementation of the program, make the program time-bound and focus on the rural areas. It will be essential to align the new surgical training program for PAs with the existing program for COs. Additionally, capacitating the complementary necessary anesthetic workforce is important as the current number of anesthetic nurses is low and there are no physician anesthesiologists in the country.

Recommendations to the MOH and CapaCare

Continued dialogue with the key stakeholders. Including the considerations of the LMDA and LMDC in the program design.

The first priory will be to reach consensus among the key stakeholders if and how to proceed with the expansion of surgical task-shifting in Liberia. Including discussion about the lessons learned from the COs' program and to discuss the possibility of starting a surgical task-shifting program for PAs.

Recommendations

1. MOH should organize a stakeholders meeting on the way forward of surgical task-shifting in Liberia involving all key stakeholders.

2. MOH to invite CapaCare to be present in Liberia and collaborate in advocacy and design of the program focusing on the training of PAs in surgery.
Ways of sensitizing doctors could be organizing a presentation by CapaCare during the Grand Rounds, at the country's tertiary hospital (JFK) where many influential doctors are working. Also, the LMDA organizes a quarterly meeting, where CapaCare could present their results of their previous research (8) *and discuss the idea of a surgical task-shifting initiative for PAs.*

In order to consider the conditions stated by the LMDA and LMDC the following recommendations can be made.

3a. MOH to develop a plan for salary harmonization prior to the start of the program in collaboration with MOF and CapaCare.
Answering the questions; what would be a reasonable salary upgrade for a PA trained in surgery? Which part of the salary would be paid by whom and for what time period during and after completion of the surgical training program?

3b. MOH in collaboration with CapaCare to develop a plan for institutionalization of the surgical training program for PAs. Institutionalization within the CUSP should be further explored.

3c. MOH in collaboration with CapaCare to propose a time-bound program and decide on the initial time frame of the program.

3d. MOH in collaboration with the regulating authority (LMDC or PA board) to limit the practice of surgically trained PAs (graduates) to the rural areas

Improving monitoring and evaluation

It was described that regulation of a new surgical cadre would be very important to ensure quality outcomes and prevent graduates from going beyond their limits.

4a. CapaCare should involve the MOH, LMDA, LMDC and LCPS in continuous review of the curriculum of the surgical training program for PAs, including defining the scope of practice and roles and responsibilities. In addition, they could be included as part of the examination committee.

*If a collaboration with a PA training institution exists this stakeholders should also be included.

4b. MOH to capacitate monitoring and evaluation by financially and technically supporting the responsible bodies (LMDC, PA Board and association) being able to full fill their tasks.

Support to the surgical infrastructure

As described in the discussion both surgical infrastructure and HR for surgery are pressing issues that need improvement. A holistic approach could lead to more doctors supporting the program.

Recommendation:

5a. MOH in collaboration with MOF to increase its budget allocated to surgical infrastructure. Possibly by partnering with other donor organizations.

5b. CapaCare to build up a strong network of partner organizations and stakeholders that are willing to invest in surgery and particularly in the surgical infrastructure of Liberia.

Additional focus on MOs and anesthetic workforce

As MOs were not formally trained in surgery previously and the complementary necessary workforce of anesthetics is very low support of these two cadres is essential.

Recommendations:

6. CapaCare to organize additional surgical training modules focusing on MOs. Especially for those MOs directly involved working with surgically trained PAs.

7. MOH to prioritize extending the output of the anesthetic training program. In collaboration with MCAI, CapaCare and other donors.

Provide a legal mandate for surgical task-shifting in Liberia

Because of the current resistance of MOs, it could help if policy with regards to surgical task-shifting would be enacted into law.

Recommendation:

8. MOH to *consider* creating a legal mandate for surgical task-shifting. This could be supported by CapaCare through organization of a field trip with the most important stakeholders, including law-makers to visit the training sites of CapaCare in Sierra Leone.

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Annexes

Annex 1

Informed consent form

What are the views among key stakeholders on surgical task-shifting in Liberia?

PURPOSE OF RESEARCH STUDY:

With this study we want to explore the different views of the key stakeholders or actors on surgical task-shifting (training of a cadre with fewer qualifications than medical doctors or medical specialists in the field of surgery) in Liberia. The aim of the study is to provide insight on the opportunities and challenges of surgical task-shifting and deliver considerations for possible future task-shifting programs, with a special focus on physician assistants in Liberia to both Ministry of Health and Social Welfare and other non-governmental organizations.
In total we will conduct 20 to 30 in depth interviews to produce a general report on the different views on surgical task-shifting. The information obtained through these interviews will be shared with the Liberian government, CapaCare and the Royal Tropical Institute. Possibly, the results of this study will be submitted for publication.

PROCEDURES:
If you agree to join this research study, you will participate in a key informant interview lasting 30-60 minutes. A trained researcher will facilitate the interview while another researcher will listen and take notes. The interview will be audio taped. Additional notes will be taken. Your name will be separated from the summary of what you say, and all personal references that might be used to identify you will be deleted.

RISKS/DISCOMFORTS AND PRIVACY MEASURES
I, the principal researcher drs. Markus-Jan Werz believe this study presents minimal risk to you. The biggest risk of participating in the study is the risk of the loss of privacy. The research team has taken a number of steps to prevent losses of privacy. The information you provide the researchers will be kept in a secure place where only the principal investigator has access to it. Audio recordings and additional notes taken will be stored for a maximum duration of 5 years after which they will be destroyed. During transcription personal data will be anonymized.
You may refuse to answer any question at any time and your refusal to participate in any way will not involve any penalties or repercussions.

We understand talking about a lack of surgical resources in the country can recall traumatic experiences of for example patients not receiving surgical care on time or at all and cause considerable grief. Don't hesitate to make this known to the principal researcher. If further discussion or help with this is necessary a follow-up appointment and counseling by one of the medical doctors of the CapaCare team (an organization training clinician health officers similar to physician assistants in surgery in Sierra Leone) will be possible free of charge in November upcoming.

ALTERNATIVES TO PARTICIPATION:
Your participation in this study is voluntary. You do not have to join this or any research study. If you do join, and later change your mind, you may quit at any time. If you refuse to join or quit early from the study, you will not be punished or lose any benefits to which you have a right.

BENEFITS:
The benefits of participating in this study are that you have the opportunity to provide your input in a structured manner regarding surgical task-shifting. The information will provide insight on the opportunities and challenges to start a surgical task-shifting program and deliver considerations for future task-shifting programs in Liberia (to both Ministry of Health and Social Welfare and other non-governmental organizations).

WITHDRAWAL PROCEDURES:
You may quit from the study at any time. You do not have to answer any questions that you do not wish to answer. If you wish to discontinue the study, please notify the study staff right away. If you refuse to join or quit early from the study, you will not be punished or lose any benefits to which you have a right.

COMPENSATION:
Participation to the study will be on voluntary basis. We highly appreciate your cooperation!

PRIVACY INFORMATION:
The principal investigator drs. M.J.Werz will take a number of steps to keep any personal information about you private to the fullest extent possible. Reports created will not identify you by name. The key informant summaries will include general characteristics of each participant, but will not include enough information that would allow anyone to identify you. Finally, all key informant summaries and related analytic files will be destroyed 5 years after the end of the project.

The entire research team is required to keep your identity confidential. The information that identifies you will not be given out to people who are not working on the study, unless you give permission.

CONTACT INFORMATION:
The information on this disclosure statement explains the rights to which you are entitled by joining this study. If at any time you have questions about the research study, you may ask the interviewer from the Royal Tropical Institute, Amsterdam, The Netherlands, or you may call the Principal Investigator, Markus-Jan Werz, +31658822849 or +23177693250 (when in Liberia). If you have questions about your rights as a study participant, you may contact the UL-PIRE IRB:

Cecelia Morris
Institutional Review Board
University of Liberia-PIRE
Monrovia, Liberia
231-886 522 833

An Institutional Review Board is a committee organized to protect the rights and welfare of human subjects involved in research.

CONSENT:
_____ has been informed of the nature and purpose of the procedures described above including any risks involved in its performance. He or she has been given time to ask any questions and these questions have been answered to the best of the investigator's ability. A signed copy of this consent form will be made available to the subject.

_____ _____
Investigator's Signature Date

I have been informed about this research study, its' possible benefits, risks, and discomforts. I hereby agree to take part in this research study as a subject. I recognize that I am free to withdraw this consent and quit this project at any time, and that doing so will not cause me any penalty or loss of benefits that I would be otherwise entitled to enjoy.

_____ _____
Subject's Signature Date

Annex 2

Stakeholder matrix prior to conducting the interviews

Player name	Level	Sector	Position	Power	Essential for research: Yes/No
Physician assistants URBAN	Regional	Professional/government	Unknown	Unknown	YES
Physician assistants RURAL	Regional	Professional/government	Unknown	Unknown	YES
Hospital administrators	Local	Professional	Unknown	Unknown	YES
Medical doctors URBAN	Regional	Professional/private	Unknown	Unknown	YES
Medical doctors RURAL	Regional	Professional/government	Unknown	Unknown	YES
MCAI midwives trained in surgery	Local	Professional	Unknown	Unknown	NO
Surgical specialists in training	Local	Professional/government	Unknown	Low	YES
Medical specialists; surgeons, gynaecologists	Local	Professional/private	Unknown	Unknown	YES
Maternal and Child Health Advocacy International (MCAI). Representatives.	International	International NGO	Low supporting	Medium	YES
Partnes In Health (PIH)	International	International NGO	Medium supporting	Unknown	NO
Liberian Medical and Dental Council. Representatives.	National	Governmental	Low opposing	High	YES
Ministry of Health and Social Welfare. Representatives.	National	Governmental	Unknown	Medium	YES
National Public health Institute of Liberia.	National	Governmental	Unknown	Unknown	Unknown
Physician assistants (PA) training institutions	National	Governmental	Unknown	Unknown	NO
President PA association.	National	Governmental	Highly supporting	Medium	YES
UNFPA	International	UN system	Unknown	Unknown	NO
WHO	International	UN system	Highly supporting	High	YES
Community	Local	Social	Unknown	Low	NO

Annex 3

Research guide

Introduction

My name is Drs. Markus-Jan Werz, I am a doctor specialized in global health and tropical medicine and currently finishing my Master in International Health at KIT, Royal Tropical Institute in Amsterdam, The Netherlands. This interview will be conducted as part of a study for my Master thesis. The aim of this study is to explore the different views of the key stakeholders on surgical task-shifting. As you are an important actor in the health sector, it is very useful for me to obtain your view (and that of your organization).
In total I will conduct 20 to 30 in-depth interviews to produce a general overview on the different views on surgical task-shifting. The information obtained through these interviews will be shared with the Liberian government, CapaCare and KIT, Royal Tropical Institute. Possibly, the results of this study will be used for publication. The information you will provide will be processed and presented in an anonymous way as stated in the informed consent form. Before proceeding we will confirm you signed the informed consent form.
This study is an additional and complementary study to a recent study of the Norway university of Science and Technology (NTNU) who visited all hospitals in Liberia and looked at the surgeries performed. They found that the unmet need for surgery is extremely high in Liberia. The optimal annual need for surgery is defined as 5000 surgical procedures per 100,000 population per year, as defined by the Lancet Commission on Global surgery. In Liberia the unmet need for surgery is on average >90% (which means 500 or less operations per 100.000 population per year), with the least surgeries being performed in the rural counties. Strategies to decrease the surgical burden, especially focusing on these rural areas, should be developed and implemented.

Note for the research team only

The research guide is designed to guide the researcher but he will not be obliged to cover all probes if other more important information comes up during the interview. The order of discussion of all the items will vary depending on the dynamic of the interview.

Themes	Probes	Questions
Acceptability	Knowledge	• How difficult is it to have surgery, when needed in Liberia? • What are the factors that make it difficult to have surgery in Liberia? • What are the main challenges for the surgical health care system in Liberia? • What do you think could be solutions to the human resource gap within the field of surgery in Liberia? • Are you familiar with the concept of surgical task-shifting? (if no: explain) if yes, see below.
	Experience	• What do you understand from the concept of surgical task-shifting?
	Attitude	• What is your experience with surgical task-shifting? • What do you think about surgical task-shifting? And why? And what about training PAs in surgery?
	Quality	• Would you support a surgical training program for PAs? If no, why not? If yes, see below. • How would you support a surgical training program for PAs?
	Competition	• Do you think a thoroughly trained PA in surgery could deliver similar health outcomes compared to a medical doctor, why yes or no? If need further clarification: under which circumstances? • How will the new surgical cadre create competition with other medical cadres? What could be solutions to this?
Feasibility	Challenges	• What could be challenges when starting a surgical training program for PAs?
	In relation to the educational system	• How do you think a curriculum for PAs trained in surgery should look like? • What could be challenges in the development of a training curriculum? • How should supervision and continuous training of the newly trained cadre be organized?

	Recognition Regulation Remuneration Referral system Benefits	• For medical doctors or specialists: how much responsibility would you give a well-functioning, surgically trained PA or surgically trained midwife? • How should the new cadre be recognized? Why? (Bsc?) • How should the new cadre be regulated? • Will there be need for new legislation? • What should be the salary of a surgical trained PA in relation to PAs not trained and medical doctors? Who will have to pay for this? (Donor or government?) • What possibilities are there of referring complicated surgical cases? • What could be benefits of training PAs in surgical task-shifting?
Appropriateness	General versus obstetric surgery (types of procedures) Midwifes versus Pas Rural versus urban Public versus private Complementary necessary workforce Gender distribution in training program	• Which surgical procedures would be accepted to be taught to PAs in surgical training, if any at all? Why these operations? • Some midwifes are already trained in surgery, how do you think another program for PAs should be combined with this program? • How does the need for surgical task-shifting differs between rural and urban? • What is your view on the new surgical cadre be working in the public sector? • And what about the private sector? • What could be pros and cons? • Is there enough anesthetic workforce to support the newly trained surgical cadre? If no, what could be solution to this? • What do you think about the need for women to be trained as surgical PAs?

Costs/sustainability	Funding Sustainability	• What are the necessary financial resources to start and continue a surgical training program for PAs? • What could be challenges and opportunities for funding? • Which organizations might be interested in collaboration? • In what form would you prefer surgical task-shifting to exist in the far future, when possibly more doctors are trained? • How to make a surgical task-shifting program sustainable?
Power relations	Influential actors	• Who are the most influential actors in the field of surgical task-shifting? And why? • Which players/ stakeholders could facilitate a program focusing on training PA within the field of surgery? • Which players/ stakeholders could oppose a program focusing on training PA within the field of surgery? • How do these stakeholders interact with each other? • What can be reasons not to support the surgical task-shifting to PAs? • What can be reasons to support the surgical task-shifting to PAs?
Adoption		• How did the tendency of government to support or not support surgical task-shifting develop from the past to where we are now and what should we expect for the future? Why?
Fidelity	Lessons to be learned from MCAI	• Is the current MCAI program different than originally set up? And how is it different?

Annex 4

Described by	**Other reasons for medical doctors not to support surgical task-shifting towards associate clinicians/PAs**
PAs, clinical obstetrician, surgical specialist	Patients and thereby salary are taken away by the newly trained cadre. Feeling of being made redundant. "He will think that I am taking him out a job." "what is going to happen is that doctors would be completely out of a job, out of job in the sense that if we look at the primary healthcare service, those patients, patients that come to the facility. They are seen by the nurses and the PAs so you hardly see a malaria case or whatever going to a doctor except is complicated. And so most of the doctors in a rural area what they do is surgery." "So, if you have the task-shifter there and so forth then of course you are telling them make free money go and relax and so forth which of course a lot of doctors want to do and so forth."
PAs, Gynecologist	Criticizing clinical skills of PAs.
PAs, surgical specialist in training	Opinion surgery should solely be performed by medical doctors or surgeons. "So most of them the fear has been, if you let this act to PAs, it means, they (the doctors) are not going to be recognized as the thing." "Some even from the council, [..]the problem is mostly with the senior doctors, those are people who graduated more than 10-15 years back. They feel that is the only thing they have. […] So, to relinquish it to a younger generation is still a problem for them, that is the concept we have right now". "Because this is the only eh eh, surgery is one of those fields that set the doctor away from the other guys. So, if you train them now to become surgeons that means you are putting us at the door."
Head of PA traininginstitution, Surgical specialist	Less acceptation if there will be no benefits attached to the program for the MDs who provide the training "The question is you want the physician assistants to train on my supervision but I shouldn't be compensated in the program, what benefit do I have?"
Surgical specialist in training, gynecologist, general practitioner	PAs will take a shortcut to become a surgical provider. "So that means you go to school for all those long years and we have nothing to do. So, if you were the one, will you accept that you go to school for more than 9 years and somebody go for three years, get the job you suppose to do, and you don't have a job no."

Gynecologist, UN representative	Influenced by negative experiences from other places, like Nigeria or the obstetric clinicians' program (see below). "Well, you know we have the West African College of Surgeons, you know, which is made of many by Nigerians and they have helped with the program in Liberia (post graduate program), and they were in the meeting we had and they said they had a similar situation in Nigeria and as time went by, the nurses, the physician assistants, the midwives, because they could do surgery, they said they wanted to have the same status with doctors and that brought a huge, you know, huge scandal, until you know, recently, they had to cancel the whole program." "I've seen just not only Liberia I can recall. That was 2013-14 there about there was a conference in Addis Ababa on task-shifting and I know that one or two countries including Nigeria expressed serious opposition to that. The professional bodies they felt that you know, that was not a good program. I, so what I believe is that some I mean people feel that you know, such a program could dilute or could jeopardize the quality, you know of services that are provided and of course, [..] these are normal things for people to think that once you are involved in something you don't want anybody to come in and spoil it or downgrade what you're doing."
Gynecologist	Bringing in a mid-level cadre to perform surgery instead of paying doctors adequately. "Government is not paying its junior doctors. Therefore, they are not coming to work. Now government is bringing in another cadre (clinical obstetricians) to do their job. As the solution should be paying the doctors adequately."
JFK representative	The leverage of going to strike if conditions are not favorable for medical doctors will be less if associate clinicians will be trained in surgery. "So, if the doctors go and strike and misbehave you have midwives' task-sharing, you have PAs that are task-sharing so they, you..."
Hospital administrator	Resistance should always be expected for something new. "Yeah, in this case, whatever case, new thing coming not everybody will accept it, yes, you know but if it goes along I think our doctors are willing to work with people that will be able to, because the goal of the entire thing is to mitigate problems that have been created in the country." […] "People may not understand the concept that might be some problem there. But as time goes on with education and awareness they will be able to understand."

LMDC representative, gynecologists	Fear that the associate clinicians trained in surgery would go beyond their limits. “I'm just afraid that people would go beyond what they were taught.” “What, if we not have compliance from the established standards, if we are getting bad results, if we are getting noncompliance from the trainees to remain in their deployed areas it could discourage government in funding.”
Hospital administrator	Miscommunication and misinformation could lead to opposition of doctors. “I said could, doctors cannot just oppose, doctors could oppose if they don't understand the program, this what I am saying the program should be clear to the doctors, know their role in it, and know the role of the physician assistant who is trained as a surgeon right, so if they don't know their role and define the role of the physician assistant it could bring friction that we talked about earlier. So, they could not fight it if the role is defined, but when the role is not defined definitely there will be problem.”
Representative of Ministry of Health	There are enough medical doctors to take care of the surgical burden of Liberia “Like I said. Where I stand personally, I don't think it's something that that is here for Liberia. It could be good for other countries now, but for Liberia, I don't think so because I think we have the doctors that are capable of taking care of the load in Liberia.”

Annex 5.

Proposed areas to be budgeted within a surgical training program for PAs, by various participants

Tuition fee of surgical training program
Rehabilitation of training center
Incentive for students (housing and living costs)
Salaries of students and graduates
Salaries of trainers (local and expat)
Training material
Building new surgical infrastructure like health centers in which graduates can work
Ensure supply of surgical and anesthesia tools
Capacitating regulatory body