AVERTING MATERNAL DEATH AND DISABILITY

Where there is no anesthetist – increasing capacity for emergency obstetric care in rural India: An evaluation of a pilot program to train general doctors

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ABSTRACT

Objective: The lack of anesthesia providers in rural public sector hospitals is a significant barrier to providing emergency obstetric care. In 2006, the state of Gujarat initiated the Life Saving Anesthetic Skills (LSAS) for Emergency Obstetric Care (EmOC) training program for medical offers (MOs). We evaluated the trained MOs' experience of the program, and identified factors leading to post-training performance. Methods: The sample was chosen to equally represent performing and nonperforming LSAS-trained MOs using purposive sampling qualitative interviews with trainees across Gujarat (n = 14). Data on facility preparedness and monthly case load were also collected. Results: Being posted with a specialist anesthesiologist and with a cooperative EmOC provider increased the likelihood that the MOs would provide anesthesia. MOs who did not provide anesthesia were more likely to have been posted with a nonperforming or uncooperative EmOC provider and were more likely to have low confidence in their ability to provide anesthesia. Facilities were found to be under prepared to tackle emergency obstetric procedures. Conclusion: Program managers should consider extending the duration of the program and placing more emphasis on practical training. Posting doctors with cooperative and performing EmOC providers will significantly improve the effectiveness of the program. A separate team of program managers who plan, monitor, and solve the problems reported by the trained MOs would further enhance the success of scaling up the training program.

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1. Introduction

Maternal mortality in India remains high at between 301 and 450 deaths per 100 000 live births. Increasing access to emergency obstetric care (EmOC) has been shown to be the most effective strategy to reduce maternal deaths [1,2].

Anesthesia is an essential component of the provision of comprehensive EmOC. However, the availability of anesthesiologists has been a significant challenge for health systems in low-income countries, including India. Consequently, many countries have delegated the provision of anesthesia to mid-level providers with fewer qualifications and less training than specialist anesthesiologists. The provision of anesthesia by mid-level health workers is widespread and has been used in more than 100 countries, and is not dependent on the presence of an anesthesiologist or the economic and development status of the country [3–6]. The shortage is especially critical in India's rural areas. Only 10% of Community Health Centers (CHCs; lower-level hospitals covering a population of 80 000 to 120 000) have anesthesiologists [7,8]. An earlier program was implemented to address the shortage of anesthesiologists

in public sector by hiring private anesthesiologists on per call basis to work in the public sector, but the program was not successful [7].

In 2002, the Government of India developed a 17-week training program, the Life Saving Anesthetic Skills (LSAS) program, specifically to train medical officers (MOs; doctors with a 5-year [MB, BS] degree from a medical college) to provide anesthesia services to EmOC providers. By 2008, the LSAS training program was being implemented in 21 states throughout India, with varying degrees of success. Despite resistance from the Indian Society of Anesthesiologists, the program has expanded. A Public Interest Litigation has been filed against the training in the Delhi High Court on the grounds that it is discriminatory to India's rural population because it provides low-quality anesthesia and compromises safety (Ministry of Health and Family Welfare official, personal communication, January 15, 2009).

Gujarat was one of the first states in India to implement the LSAS training. After an initial pilot of the training with doctors from the state of Chhattisgarh, state officials from Gujarat developed their own program based on the central government's guidelines. The first cohort of MOs began training on February 27, 2006. Since then, 4 additional cohorts have been trained at 4 different medical colleges throughout the state. Each center had the capacity to train 4 MOs at a time.

The LSAS training program in Gujarat consists of 2 parts. Twelve weeks are spent at the medical college level where MOs are taught

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anesthesia theory and resuscitation skills, and are given practical experience in these areas. This is followed by 6 weeks in a district hospital for further practical training in anesthesia and resuscitation skills. The district hospital often provides trained MOs with a better approximation of the conditions facing them at the CHC level than does a medical college. Trainers are present at both sites and are responsible for coaching the MOs through the anesthesia skills necessary to manage obstetric emergencies. Resuscitation is particularly emphasized throughout the training. Although LSAS-trained doctors posted at first referral units (FRUs; facilities designated as referral centers for EmOC, which could be either district hospitals or CHCs) may not be able to provide anesthesia for all obstetric emergencies, they are taught the skills to be able to resuscitate and stabilize the mother in order to transfer her to a higher referral facility. Thus helping save the life of the mother.

During the training, participants are tested 3 times, and a minimum score at each testing must be achieved to pass the program. Successful trainees are given a certificate from the state government documenting that the trainee has completed the program and is trained to provide anesthesia and resuscitation for obstetric emergencies at FRUs throughout Gujarat. At the end of the program, the trained MOs are also asked to evaluate the coursework and skill development exercises at both the medical college and district hospital level. Program managers use these evaluations to monitor the success of the training module. Since 2006, the government has placed 51 LSAS-trained medical officers at FRUs throughout the state.

The Gujarat government, showing considerable political will, appointed a focal person for both the LSAS and the18-week EmOC training program for MOs [9]. This focal person arranged the training of trainers and provided all other materials to the medical colleges to ensure standardized training programs. Despite this, variability remains in the program across the centers. In interviews, trained MOs reported that 2 of the 4 centers had a stronger emphasis on practical training and support.

Since the LSAS training began in 2002, it has been evaluated only once at national level, in 2008 [9]. Considerable variability in the implementation among the states was found. However, neither the program's impact on the operation of FRUs nor the factors leading to successful use of skills gained in the training have been fully examined.

The key objectives of the present study were to assess the trained MOs' experiences of the program and to identify factors leading to performance or nonperformance after training. For this evaluation, we collected data through interviews with LSAS-trained MOs, program trainers, and administrative managers of the initiative.

2. Materials and methods

Data collection consisted of a series of in-depth interviews with key stakeholders from September 11 to November 27, 2008. We interviewed 14 of the 51 LSAS-trained MOs who completed the training between 2006 and 2008, as well as program trainers (at both medical colleges and district hospitals that served as instruction sites for LSAS-trained MOs), officials at the State Institute of Health and Family Welfare, and national program administrators in New Delhi.

We selected the sample of trained MOs through consultation with state government officials. Because of resource constraints and the amount of time required to conduct in-depth qualitative interviews, we interviewed only 14 individuals. The Government of Gujarat provided a list of all of the trained MOs who had completed the training from the first 4 cohorts: 51 trained MOs in all (from February 2006 to May 2008). From that group, with guidance from the state health department, we purposively selected a sample of 14 trained MOs. The 14 were not randomly chosen, but were selected to ensure regional representation (covering 13 of Gujarat's 26 districts), and representation from each cohort and training center. The state government's LSAS focal person (and fifth author on this paper, AD) classified 7 of the 14 to be providing anesthesia ("performing") in their postings after the training and 7 who

were not providing anesthesia ("not performing"). By choosing a purposeful sample this way, we sought not to estimate the proportion of all trained medical officers who were performing successfully, but to understand the main factors leading to use of the new skills after training.

"Performing" was defined to capture those trained MOs who were considered by Government officials (specifically by AD) to be regularly using the resuscitation or anesthesia skills that they had been taught in LSAS training to manage obstetric emergencies. Government officials were able to classify the trained MOs into these two categories through prior network surveillance. Through having an equal sample of performing and nonperforming trained medical officers, we detected factors leading to successful and unsuccessful implementation of LSAS service delivery.

Each in-depth interview carried out at the site of the posting of the trained MO lasted 1.5 to 2 hours and covered several topics. We asked trained MOs about their work before the training, the training content, the posting procedures, their skill usage and abilities, and supervision after completing the training. Furthermore, to quantify the impact of a trainee's placement on maternal healthcare service delivery, we also collected data from health facilities on the number of normal deliveries and cesarean deliveries (both before and after the trainee's arrival). Finally, we collected basic data on the treatment capacity of each facility and demographic data of the LSAS-trained MOs.

All interviews were transcribed and coded for salient themes. During transcription, identifying information was removed from each interview, and a number was assigned to protect each respondent's confidentiality.

3. Results

In addition to basic demographic information, the data collected through these in-depth interviews fell into 5 broad categories: training program, posting and facilities, training outcomes, monitoring and support, and career progression and incentives.

3.1. Demographic information

The sample was made up of 14 LSAS-trained doctors who had already completed the program. At the time of the study, 4 cohorts of students had completed the training, with each cohort comprising students at 4 different training centers. The sample included trainees from each cohort. The average number of years in government service was 8.5 years (range, 3–18 years). There were 13 men and 1 woman (only 2 of the 51 trained MOs were women).

3.2. Training program

Although generally very positive about most aspects of the training, some of the trained MOs detected weaknesses in the practical part, both at the medical college and at the district hospital. Most felt that the learning environment was affected by the presence of postgraduate anesthesiology students during the medical college portion of the training. Trained MOs reported that postgraduate students received more attention and more opportunities to practice their anesthesia skills than the MOs in LSAS training. In addition, 6 of the 14 respondents stated that the practical training duration was too short. With more time, trained MOs said they would be able to see more cases to gain confidence in their skills. Similarly, 12 of the 14 respondents also said that refresher training was necessary, especially for doctors who did not use their skills regularly.

3.3. Posting and facilities

After the training program, the focal person for the LSAS program made the posting (job assignments) decisions for the LSAS-trained

Table 1

Characteristics of anesthesia-trained general practitioners who used their new skills frequently, rarely, or not at all; Gujarat, India 2006–2008.

Posting conditions	Providing anesthesia							Not providing anesthesia						
	Frequently				Rarely [a]									
MO number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Posted with anesthesiologist	✔	✔	✔				✔						✔	
Posted to facility with private anesthesiologists accessible	✔			✔			✔	✔	✔	✔	✔	✔		✔
Posted with ObGyn	✔			✔			✔					✔	✔	✔
Posted with active EmOC-trained doctor		✔	✔		✔				✔					
Posted with general surgeon	✔	✔	✔	✔	✔	✔	✔						✔	
Posted to high volume first referral unit facilities	✔	✔	✔			✔	✔						✔	
Posted to large district level hospital	✔						✔						✔	✔
Posted to community health center		✔	✔		✔	✔			✔	✔	✔	✔		
Posted to facility with blood services available	✔			✔			✔							

Abbreviations: MO, medical officer.

[a] Giving anesthesia for cesarean delivery once a month or less.

doctors (rather than the State Health Commissioner who previously made them). The majority of trained MOs were posted to CHCs (9 out of 14), but 4 were posted to larger referral hospitals (district or subdistrict level hospitals) and 1 worked at a non-profit hospital. By taking control of the process for the LSAS-trained MOs, the focal person was able to place doctors in areas where their skills were needed and could best be utilized. The same focal person also posts the EmOC-trained MOs, and was therefore often able to place EmOC- and LSAS- trained MOs as a pair to ensure that an FRU could provide EmOC. However, because the LSAS focal person only has control over the posting of LSAS- and EmOC-trained MOs (and not specialists, such as gynecologists or general surgeons), some posting mismatches continue to occur, leading to lower use of the new skills.

3.3.1. Human resources at posting locations

Table 1 shows the impact of posting differences on the performance of trainees. Although 6 of the 14 LSAS-trained MOs were posted with EmOC-trained MOs, 2 of the latter were not performing cesarean deliveries. Of the 8 other LSAS-trained MOs, 4 were posted with obstetrician-gynecologists, of whom 2 were performing neither cesarean deliveries nor emergency obstetric surgery. One LSAS-trained MO was the only doctor in the facility. This represents an overall positive

trend toward posting anesthesia-trained MOs with personnel trained in EmOC.

Five of the 14 trained MOs were posted to a facility with an anesthesiologist present. One was posted in a facility with an MO who had previously completed a short training in anesthesia. Nine of the trained MOs were posted to facilities where local private anesthesiologists were accessible (to provide or supplement anesthesia services in the facility).

Several of the trained MOs were posted in facilities with only one or two other MOs. This limits their ability to provide anesthesia given that the LSAS-trained MOs are not only responsible for their regular duty of general patient care during the day, but also for medico-legal duties (postmortems, judicial matters, etc.) and public health programs. When the primary duties of the MOs became time consuming, LSAS-trained MOs reported that they often faced pressure to refer EmOC cases to a higher level facility, rather than conduct emergency procedures themselves. As the LSAS-trained MOs were still primarily medical officers and not anesthesiologists, they felt that EmOC duties such as giving anesthesia for cesarean were not their primary duty even after training.

3.3.2. Facilities to which the LSAS-trained MOs were posted

Twelve of the 14 trained MOs reported having all the equipment they needed for anesthesia. Trained MOs were posted in facilities that ranged from upgraded primary health centers with few beds (in one case, 13 beds only, which was low for a facility that had been charged by the government to fulfill the mandate of a community health center) to district hospitals (with 100–200 beds).

Eleven of the 14 FRUs in which trained MOs are currently working have no functional blood storage facility. This is particularly troubling because blood storage capacity is one of the integral elements in the government's definition of a first-referral unit, and policy was amended to allow blood storage at CHCs back in December 2001. Without blood storage capacity it is difficult to provide adequate surgical services, particularly in emergencies. However, some facilities did have access to a local blood bank or blood storage facility through the Red Cross or other nongovernmental organizations (NGOs).

3.4. Outcomes

The training module for LSAS specifies a skill set to be acquired through the program. In Gujarat, the goal of teaching these skills to MOs is to prepare them to manage obstetric emergencies effectively at FRUs. To assess the performance of LSAS doctors after the training, we asked the trainees to report their skill usage in 8 areas shown below in Table 2.

3.4.1. Spinal anesthesia

Although almost all (13/14) MOs had given spinal anesthesia at least once since being placed in an FRU, the frequency varied greatly, with some trained MOs giving it several times a day, while others had

Table 2

Use of anesthesia skills in last 3 months by LSAS-trained medical officers.[a]

Skills	LSAS-trained medical officer														Number using skill
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Pre-anesthesia check up	✔	✔	✔	✔	✔	✔	✔	✔	✔			✔	✔	✔	12
Spinal anesthesia	✔	✔	✔	✔	✔			✔	✔	✔		✔	✔	✔	11
General anesthesia		✔	b									✔			2
Local anesthesia	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	14
Resuscitation of newborn	✔	✔	✔	✔			✔	✔	✔	✔	✔	✔	✔		11
Resuscitation of mother	✔	✔	✔									✔	✔		5
Laryngoscopy and endotracheal intubation	✔	✔	✔	✔	✔			✔		✔	✔	✔	✔		10
Postoperative care	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	13
Number of skills used	7	8	7	6	5	3	4	6	5	5	3	7	8	4	

[a] The 3-month period represents the time period 3 months prior to the interview with the trained medical officer.

[b] Performed general anesthesia but not independently.

only given it once or twice since completing training. Those who gave spinal anesthesia less regularly were often less confident in their skills, or faced logistic barriers, such as lack of an EmOC provider at their facility.

3.4.2. General anesthesia

General anesthesia was not emphasized during the training, and trainees' confidence to give general anesthesia was low. However, 3 of the 14 trained MOs did give general anesthesia at their FRUs; 2 of the 3 were posted with an anesthesiologist who gave further guidance, coaching and training, and the third was himself an obstetrician-gynecologist working at an NGO hospital (and given special entrance to the program). He had prior experience in anesthesia but only felt comfortable giving general anesthesia after the LSAS training.

3.4.3. Resuscitation

Six of the 14 trainees used their LSAS skills to resuscitate mothers during obstetric emergencies. Four of these 6 also frequently gave spinal anesthesia; the other 2 rarely or never did, but were still able to save mothers' lives through resuscitation. Their skills were used to stabilize a patient or keep a patient alive until she reached a higher level of specialized care. Although MOs in India are expected to know basic resuscitation techniques, they may have forgotten them owing to lack of use in facilities such as primary health centers. Thirteen of the 14 also used their LSAS training to resuscitate newborns.

3.5. Anesthesia for cesarean delivery

We found several trends regarding provision of anesthesia for cesarean delivery. The LSAS-trained MOs were classified into 3 groups: frequently performing (giving anesthesia for obstetric emergencies at least once a week); rarely performing (giving anesthesia for obstetric emergencies at least once a month), and nonperforming (less than once a month or never). For each group, clear trends were common; Table 1 illustrates factors that may help to determine the outcome once a trained MO leaves the program.

3.5.1. Frequently performing

Frequently performing MOs were found to use their LSAS skills in nonobstetric emergencies when required. In two facilities (FRUs) there was a sharp increase in the number of both normal and cesarean deliveries after an LSAS-trained MO began working there. In one case the monthly average number of normal deliveries per month rose from 29 to 41 and the average number of cesarean deliveries rose from 0 to 3 after the LSAS-trained doctor arrived. In another case, normal deliveries rose from 18 to 27 and cesarean deliveries rose from 0 to 4 per month.

Four of the 14 trained MOs were frequently giving anesthesia for cesarean delivery and were also resuscitating mothers during obstetric complications (Table 1). The characteristics common among these 4 doctors were that they were:

- *Posted with an anesthesiologist:* The 3 trained MOs posted with an anesthesiologist were more confident of their abilities and able to work independently, and with the support of the surgeons or obstetrician-gynecologists in their centers. The presence of a specialist had a significant impact on their ability to practice confidently and to hone their skills, given that there was assistance readily available if needed. A cooperative relationship between the specialist and the LSAS-trained MO was beneficial to both by reducing the load of the specialist including off hours. Furthermore, the LSAS-trained MOs expanded their services beyond EmOC into other procedures needing anesthesia or resuscitation.
- *Posted with an EmOC provider who was supportive and had confidence in the MO's LSAS skills:* All 3 trained MOs who frequently gave anesthesia reported that the EmOC providers at their facilities were supportive and actively engaged them to give anesthesia for cesarean deliveries.

In 2 cases, the team of the LSAS-trained MO and the EmOC-trained MO were conducting all the cesarean deliveries performed in the hospital.

3.5.2. Rarely performing

Trained MOs who rarely perform anesthesia face both infrastructure and human resource barriers, which limit their practice of anesthesia. While their skills remain an asset to the community, their lack of use could limit their ability to maintain their skills.

Three of the 14 trained MOs rarely gave anesthesia. One of the 3 used his LSAS skills to resuscitate. The characteristics common among these trainees (Table 1) include:

- *Skills already available in the facility:* Although 2 of the trainees (one rarely performing, one nonperforming) were placed with a supportive EmOC provider who encouraged them to practice their skills, they were posted to a facility where their skills were rarely needed because there was already more than one qualified anesthesiologist.
- *Too few cases at the FRU:* Although the trained medical officers categorized as rarely performing generally were confident in their ability to perform and had supportive colleagues, 2 were limited by the low incidence of complicated deliveries at the facility. The desire to maintain skill levels despite the low case load also led one LSAS-trained MO to use his skills in private or nongovernmental facilities.

3.5.3. Nonperforming

Nonperforming trained MOs were those who used their skills less than once a month or never. Although 7 LSAS-trained MOs had not used their anesthesia skills since completing the course, they were using the resuscitation techniques learned in the training, and had a higher degree of confidence than before the beginning the program. One trainee emphasized that he was using these skills to resuscitate mothers during obstetric emergencies. The characteristics common among this group were that they were:

- *Posted with uncooperative or nonperforming obstetricians and EmOC providers:* Three of the trained MOs in this study were placed with obstetric staff who severely inhibited their provision of anesthesia during obstetric emergencies. The reasons for this ranged from the inability of the EmOC provider to perform procedures, to the refusal of the EmOC provider to perform procedures at the facilities owing to either absenteeism or delinquency of medical responsibilities.
- *Personal lack of confidence in LSAS skills:* The lack of confidence was due to two factors. Five respondents felt that the training had not sufficiently prepared them to provide LSAS adequately and safely. However, 6 had had so little exposure to obstetric emergencies since the training that they no longer had the confidence to provide anesthesia or resuscitation.
- *EmOC provider lacking confidence in LSAS-trained MOs' skills:* Three trained MOs were not giving anesthesia largely because the EmOC providers lacked confidence in the LSAS-trained MOs' abilities. Two of the 3 reported that they had made a mistake while giving anesthesia that had changed their partner EmOC providers' willingness to work with them during obstetric emergencies.

4. Monitoring, support, and mentoring

4.1. Monitoring

The government has been unable to comprehensively monitor the performance of the LSAS-trained MOs when they leave the program. A form was developed for trainees to document the use of their LSAS skills and information on obstetric emergencies requiring anesthesia, and to submit to the government quarterly, regardless of the level of skills provided. However, only 7 of the 14 trainees said they were aware of this and only 2 were completing and returning it to the

government. Furthermore, LSAS-trained MOs reported that program managers sent no reminders to complete the form.

4.2. Support and mentoring

Only 5 trainees reported that there was a formal system of supervision after leaving the program. This system of supervision consisted of a pro-forma which LSAS-trained MOs completed to indicate their skill usage over a set period of time. Although the majority of LSAS-trained MOs said they were not aware of a formal system of supervision, 13 out of the 14 trained medical officers did report that informally, they could maintain contact with program administrators and trainers via telephone. Only 3 of the trained MOs said they had been contacted by the program trainers since leaving the program, but half said that they had contacted their trainers for questions and advice on cases. Among this group, some trained medical officers had a supportive relationship with the district hospital trainers and some had a better relationship with the trainers at the medical college level. The relationships with program trainers and administrators were reported to be strictly informal as no official mentoring and support arrangements had been made by the training program, even though a hierarchical supervision system was reported by some trainees.

4.3. Incentives and career progression

An incentive scheme for EmOC providers, anesthesia providers, and support staff exists by which each member of the team providing EmOC receives a monetary incentive. However, this incentive scheme is only applicable for centers where 50 or more deliveries are conducted per month. As this number is quite high, most FRU staff get no incentive. Because of the high number of deliveries needed to qualify for incentives for district hospitals, the benefit of the scheme is also not available for employees of larger district-level hospitals either, as the number of deliveries at such hospitals also does not cross the required higher levels. Ten trainees stated that some incentive—job promotion, salary increases, monetary performance-based incentives, or entry into a postgraduate program—would improve motivation. Most of the LSAS-trained MOs (9 of 14) said they would like to pursue a postgraduate degree. However, owing to age limitations and difficulties in gaining admission to these programs, only 2 LSAS-trained MOs were actively pursuing applications in anesthesia.

5. Discussion

The LSAS training program in Gujarat is an important initiative that is contributing to increasing women's access to lifesaving anesthesia during obstetric emergencies. Indeed, the presence of LSAS-trained MOs is the reason several FRUs across the state now function as comprehensive EmOC facilities. Given the human resources constraints facing the state health system (particularly among the specialist cadre), the program is filling a critical gap. Furthermore, in training doctors in resuscitation skills, the program also helps to strengthen the ability of medical officers to save lives in nonobstetric emergencies.

The program has been well-served by committed managers who believe in the program and are willing to allocate resources to it. The state has also shown strong political will for the execution of the program, particularly since Gujarat initiated the training before any other state acted on the central government's recommendation to do so. This is especially impressive given the opposition from the Indian Society of Anesthesiologists.

However, to fully maximize the potential of this innovative program, the state government should consider making our recommended changes in the future. By lengthening the training and by providing for other ways to increase confidence among trained medical officers (temporary posting with an anesthesiologist after the training and/or refresher courses), the government could help to ensure that a maximum number of LSAS-trained MOs are posted to FRUs with the self-efficacy to provide anesthesia. Certain revisions to the program can contribute to its sustainability as well as its effectiveness in providing EmOC to the communities that require it the most. This study indicates an urgent need for further research concerning the effectiveness of LSAS training programs in India, as well task shifting programs overall.

Our evaluation has certain limitations. The sample was purposively chosen to represent both performing and nonperforming MOs and is therefore not representative of the functioning of the program as a whole. In addition, the sample was chosen through consultation with government officials and not an independent body. As with any nonrandom sample, it is important to remember that biases may have influenced the findings. However, this evaluation identified both strengths and weaknesses, and we believe we are justified in making certain recommendations.

6. Recommendations

Despite the limitations of the study, we are able to make several recommendations.

- The length of the current program in Gujarat (18 weeks), although adequate for some students, should be extended by at least 6 weeks.
- There is an overwhelming demand for refresher training. Refresher training should be considered for all interested participants for a period between 15 days and one month at district hospitals, thereby providing sufficient time and ample cases to practice techniques. A shorter refresher training would allow medical officers to return to their posting in an appropriate period of time.
- Our survey showed significant variation in respondents' understanding of their legal protections as anesthesia providers. This may compromise the confidence of LSAS-trained MOs in providing anesthesia. In the future, the training module should contain a section that explicitly states that the provision of anesthesia by LSAS-trained MOs is legal under specific conditions.
- A key finding of this assessment is the high value LSAS-trained MOs placed on the resuscitation portion of the training. The focus on resuscitation should be continued in future training programs and trainers in medical colleges should aim to provide adequate experience to gain skills and confidence.
- LSAS-trained MOs must be posted with an EmOC provider who is consistently performing in order to achieve full functionality of FRUs. It is also important that EmOC providers are counseled to accept LSAS-trained MOs. Without active dialogue with program managers, trainers, or district health officers, some providers may remain unwilling to make use of the skills of LSAS-trained.
- The lack of blood storage and banking facilities is widespread and it is critical that this capacity is strengthened at FRUs. Lack of blood storage capacity jeopardizes surgical services, particularly in emergencies.
- Equipment for neonatal resuscitation must be acquired and used.
- Program managers should consider posting all LSAS-trained MOs with an anesthesiologist for a short period of time (2–3 months) following the training. If LSAS-trained MOs are immediately posted to facilities without anesthesiologists, they should be placed under the guidance of an anesthesiologist in a nearby facility to provide continued support and mentoring.
- As monitoring was shown to be a weak component of the program, program managers and trainers should develop a functional monitoring system. Without systematic recording of anesthesia data (in a summary form), there is no way to fully track LSAS performance in the state. Trainers should stress the importance of monitoring mechanisms during the training. The monitoring form should include a section for open-ended feedback and should ask MOs to list the obstacles they face in giving anesthesia.
- The state health department should also develop a team of 2 or 3 technical managers to plan, monitor, and scale up the LSAS training,

monitoring, and evaluation. This team will also ensure that LSAS-trained MOs' problems are addressed and that their performance is monitored.

• Well structured and clear job descriptions can vastly improve the professional experience of MOs trained in LSAS. We found that several respondents were unclear as to how to prioritize their work, given that they now had duties beyond those of a medical officer. Program managers should also look into performance-linked incentives for MOs.

Acknowledgments

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