Saving Lives Through Safe Surgery in Ethiopia: Project Implementation Manual

Developed by Safe Surgery 2020, in collaboration with Federal Ministry of Health of Ethiopia

Federal Democratic Republic of Ethiopia
Ministry of Health

SaLTS
Saving Lives Through Safe Surgery

GE Foundation

Safe Surgery 2020

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I. ABBREVIATIONS

BMET	Bio-Medical Equipment Technician
BUN	Blood Urea and Nitrogen
CBC	Complete Blood Count
CEO	Chief Executive Officer
COE	Center of Excellence
EESC	Emergency and Essential Surgical Care
EHAQ	Ethiopia Hospital Alliance for Quality
FAF	Facility Accelerator Fund
FMOH	Federal Ministry of Health
HAT	Hospital Assessment Tool
HMIS	Health Management Information System
HST	Health Sector Transformation Plan
HTM	Healthcare Technology Management
IESO	Integrated Emergency Surgical Officer
ImPact	Improving Peri-Operative and Anesthesia Care and Training
KPI	Key Performance Indicators
LCOGS	Lancet Commission on Global Surgery
LMS	Learning Management System
NGO	Non Governmental Organization
OR	Operating Room
OBGYN	Obstetrician/Gynecologist
PGSSC	Program in Global Surgery and Social Change
PIM	Project Implementation Manual
POMR	Peri-Operative Mortality Rate
PMT	Project Management Team
RHB	Regional Health Bureau
SALTS	Saving Lives Through Safe Surgery
SAT	WHO Situational Analysis Tool
SPECT	Sterile Processing Education Charitable Trust
SS2020	Safe Surgery 2020
SSE	Surgical Society of Ethiopia
SSI	Surgical Site Infection
TOT	Training of Trainers
TWG	Technical Working Group
WFSA	World Federation of Societies of Anesthesiologists
WHA	World Health Assembly
WHO	World Health Organization

II. ACKNOWLEDGMENTS

The Safe Surgery 2020 (SS2020) initiative would like to thank Federal Ministry of Health (FMOH) for their longstanding partnership to increase access to safe surgical care in Ethiopia. In particular, thank you to the Health Services Quality Directorate for providing insights and guidance through the development of this SaLTS Project Implementation Manual (PIM). Special gratitude to Dr. Hillina Tadesse Director, Health Service Quality Directorate, and to the SaLTS Case team for leading the overall process for the development of the PIM.

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Many partners have contributed inputs, insights and guidance in the development of this manual. We are grateful for their time and expertise.

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Additional contributing partners include:
Lifebox
SPECT
WFSA
ImPACT Africa
VUMC

III. FOREWARD

The Ethiopian Government, through the FMOH, has prioritized surgical and anesthesia care due to the significant unmet need — the estimated surgical volume is 43 per 100,000 population, against a target of 5,000 per 100,000 population recommended by the Lancet Commission on Global Surgery (LCoGS) report in 2015 [1]. In 2016, the FMOH developed a blueprint for improvement of surgical and anesthesia care in Ethiopia referred to as the Saving Lives Through Safe Surgery (SaLTS) strategy [2]. The SaLTS strategy is Ethiopia's national flagship initiative designed to improve access to safe, essential, and emergency surgical and anesthesia care across all levels of the healthcare system.

The FMOH, working with its partners, has been implementing the SaLTS strategy since 2016 in various regions in Ethiopia. There are significant achievements under each of the 8 pillars of the SaLTS strategy. This includes, but is not limited to:

1. **Leadership, management and governance** — a surgical leadership and mentorship program was tested in Amhara and Tigray and is now being scaled nationally to develop leaders who will transform surgical and anesthesia care in Ethiopia.
2. **Infrastructure** — construction and equipping of operating rooms and oxygen production and distribution plant.
3. **Supplies and logistics** — development of a national essential surgical procedure and equipment list.
4. **Human resource development** — development of a Surgical Workforce Expansion Plan and Anesthesia National Roadmap.
5. **Advocacy and partnership** — strong FMOH partnership with international organizations, including GE Foundation's Safe Surgery 2020 initiative.
6. **Innovation** — facility-driven identification of problems and implementation of locally developed solutions.
7. **Quality of surgical and anesthesia care service delivery** — a national peri-operative guideline and WHO Surgical Safety Checklist implementation.
8. **Monitoring and evaluation** — a comprehensive plan for short- and long-term assessment of surgical quality and capacity.

The FMOH is scaling up implementation of the SaLTS strategy to all regions. The public health facilities in Ethiopia are grouped into clusters through Ethiopian Hospitals Alliance for Quality (EHAQ) platform for purposes of implementation of interventions. Currently, there are 47 such clusters comprising of all hospitals.

The SaLTS PIM is a comprehensive guide for the development, implementation, and closure of the projects within the SaLTS initiative. The PIM sets out details of the package of activities that will be implemented in all the 47 clusters, and provides a step-by-step guide for their implementation in a cluster setting.

IV. INTRODUCTION

Purpose

The PIM has been developed as part of national efforts to standardize and harmonize implementation of projects under the SaLTS initiative in all the 47 clusters. The manual provides guidance on project design, implementation, monitoring, management, and closure.

The PIM provides detailed guidance for the FMOH, regional health bureaus (RHB), and partners involved in implementation of the SaLTS strategy. Over time, it can be used as a reference tool to assess whether implementation aligns with initial plans (and if not, to understand what has changed, and why it has changed), and as a primer for new partners. The PIM is intended to be dynamic and is subject to ongoing amendment as the SaLTS strategy evolves and new projects are implemented.

Process

The PIM was developed by Safe Surgery 2020 lead partners (Jhpiego, Assist International, Harvard Medical School Program in Global Surgery and Social Change, and Dalberg Advisors), in collaboration with the SaLTS Project Management Team.
The process included collaborative working sessions with lead partners, expert interviews, and workshops with different partners.

Audience

The PIM is designed for use by all stakeholders at national, regional, and district levels involved in implementation of SaLTS strategy. It outlines implementation recommendations, procedures, and processes with the dual objective to forge strong partnerships and relationships across all key stakeholders and to ensure the long-term sustainability of all SaLTS initiatives.

Structure

The PIM contains an introduction section that provides an overview to the SaLTS strategy and lays out how the PIM links to the SaLTS strategy. It also contains the recommended package of interventions including a section for each of the interventions recommended for implementation in the 47 clusters in Ethiopia.

The PIM also contains recommendations for the structure required to effectively implement the SaLTS strategy; this includes the transformations that are required and implications on the system, as well as implications on the way forward for SaLTS. The PIM also has an annex section with links to the tools, templates,v and guides that can be used in the implementation of the programs and projects outlined in the PIM.

V. OVERVIEW OF THE SAVING LIVES THROUGH SAFE SURGERY (SALTS) INITIATIVE

Background

Recent studies have shown that surgically treatable health conditions constitute the majority of global disease burden. However, surgical care has not been prioritized in global health discourse.

Also, despite the misperception by policy makers that surgical care is complicated and prohibitively expensive, studies now show that essential and emergency surgical care is cost-effective compared to other interventions. The evidence has triggered discussion about the need for universal coverage of essential and emergency surgical care and financing surgical care early on the path to universal health coverage.

The 2015 World Health Assembly (WHA) Resolution 68/15 was introduced as a result of understanding the importance of surgical care in a country's health and economic development. The Resolution recognizes surgical care as an essential part of universal health coverage. With this shared aim, the Ethiopian FMOH launched the Saving Lives through Safe Surgery (SaLTS) initiative in 2015.

In October 2015, the Ministry launched the fifth strategic plan titled *Health Sector Transformation Plan (HSTP) 2015/16 - 2019/20* which is aligned with country's second growth and transformation plan (GTP-2). The HSTP identifies quality and equity as cornerstones of the health care transformation agenda that focuses on essential and emergency surgical and anesthesia care in addition to maternal, neonatal and child health, nutrition, chronic non-communicable diseases, and infectious diseases.

SaLTS strategy and its pillars

According to the LCoGS, properly equipped primary hospitals in low-income countries can perform emergency surgery for a number of conditions, including obstetric complications, abdominal emergencies, and injuries (such as fractures, dislocations, amputations, and burns) [3].

However, many primary hospitals in rural Ethiopia lack the appropriate human resources, equipment, and supplies necessary to provide these services.

The Ethiopian FMOH is among the trailblazing Ministries of Health from low and middle-income countries that have developed a national plan to improve access and quality of surgical care. The SaLTS strategy defines Ethiopia's plan to avail a package of essential and emergency surgical and anesthesia care at all levels of the health care delivery system. The strategy places special emphasis on strengthening primary care to provide essential surgical care. The SaLTS strategic plan has eight pillars. A more detailed overview of the pillars is contained in Annex 1.

Figure 1: The eight pillars of the SaLTS strategy

| 1. Leadership management and governance | 2. Infrastructure | 3. Supplies and logistics | 4. Human resources | 5. Advocacy and partnership | 6. Innovation | 7. Quality of surgical anesthesia care & service delivery | 8. Monitoring and evaluation |

To improve equitable access to safe essential and emergency surgical and anesthesia care as part of the universal health coverage, the SaLTS strategy has the following objectives:

> To implement a nationally coordinated national plan on surgical care.

> To define and implement an essential surgery package for all levels of the Ethiopian health care delivery system.

> To create better awareness on surgical and anesthesia care with different stakeholders.

> To improve the safety of surgical care by implementing the surgical safety checklist and improving the safety culture.

> To implement a quality improvement and audit tool in surgical care.

> To proactively identify best practices and scale up rapidly through the EHAQ.

Safe Surgery 2020 partnership with FMOH

Safe Surgery 2020 is a multi-partner initiative to design and support hospital-level solutions that make surgery safe, accessible, and affordable for all.

The initiative works closely with countries to understand their priorities, select partner hospitals, and match hospitals with programs that will help them reach their goals of transforming surgical outcomes, and become models for others to follow for national scale-up.

Safe Surgery 2020's primary strategic goal is to drive major improvements in the volume and quality of emergency and essential surgical procedures in primary health care facilities and district-level hospitals.

To achieve this goal, Safe Surgery 2020 has four key objectives which are accomplished through the leadership and networks of its implementing partners:

1. Advocate for increased prioritization of surgery at the national level, and support Ministries of Health to prioritize surgery in their national surgical planning process;

2. Develop and scale a leadership development program for surgical teams that improves their ability to communicate effectively, problem solve around resource constraints, and lead the way to transforming care at their hospitals;

3. Enable increased innovation in safe surgery and anesthesia through partnerships and direct programs in priority areas for partner countries and hospitals;

4. Support the design and implementation of robust monitoring and evaluation systems to continuously monitor and improve programs, build local and national capacity for collecting and reporting on surgical indicators, and avoid duplicative efforts.

Safe Surgery 2020 Ethiopia programs

In 2016, Safe Surgery 2020 launched its programs in Ethiopia by establishing partnerships with the FMOH and other local partners including the Surgical Society of Ethiopia, Ethiopian Society of Anesthesiologists, Ayder University Hospital (Mekelle), Felege Hiwot Hospital in association with Bahir Dar University, Addis Ababa University School of Medicine, and others. Safe Surgery 2020 programs are designed to support implementation of the SaLTS strategy [4]. The FMOH also works with other partners to implement the SaLTS strategy.

Figure 2: SaLTS partners and stakeholders

Some of the achievements from the partnership between the FMOH and Safe Surgery 2020 include:

→ Contributed to the development and implementation of SaLTS strategy

→ Built capacity of 130 surgical leaders and clinical mentors

→ Enhanced leadership capacity of FMOH, RHBs, and hospitals and catalyzed national scale-up of a Jhpiego-led leadership program to impact at least 1,000 more leaders

→ Developed a public-private partnership for two medical oxygen plants which serve the Amhara region, coordinated by Assist International

→ Conducted rigorous assessment of our programs to understand what works – and what doesn't

→ Trained 400 hospital staff on sterilization and surgical infection prevention; trained approximately 200 hospital staff on anesthesia best practices

→ Supported SaLTS team to develop a monitoring and evaluation plan for the SaLTS strategic plan, including 15 Key Performance Indicators (KPIs) to measure the capacity and quality of surgical care in hospitals in Ethiopia

→ Implemented a surgical data quality improvement intervention in all intervention hospitals

→ Donated equipment to several hospitals to improve hospital infrastructure

At partner hospitals supported by Safe Surgery 2020, surgical teams have implemented quality improvement projects such as reducing surgical site infections and minimizing the no-show rate for elective surgery.

Evaluation of the Safe Surgery 2020 Ethiopia program

To assess the achievements of Safe Surgery 2020 Ethiopia program, a mixed-methods evaluation of the program was conducted in late 2018. Quantitative evaluation data collection for Safe Surgery 2020 Ethiopia consisted of annual administration of the World Health Organization Tool for Situational Analysis (WHO SAT) and monthly data collection of two Key Performance Indicators (Surgical Volume and Referrals Out) in the 10 hospitals supported by Safe Surgery 2020. The results of these data collection methodologies are described in Table 1.

Table 1: Results of the Safe Surgery 2020 evaluation

AREA OF IMPACT	TOOL & TIMEFRAME	RESULTS
I. Infrastructure	Baseline to endline analysis of the Situational Analysis Tool	**Majority of hospitals saw improvement or no change in infrastructure.** • Water: 80% of hospitals positive change or no change • Electricity: 80% of hospitals positive change or no change • Generator: 100% of hospitals positive change or no change • Internet: 60% of hospitals positive change or no change • Oxygen: 90% of hospitals positive change or no change
II. Surgical procedures	Baseline to endline analysis of the Situational Analysis Tool	**Availability increased for 15 of 23 procedures.** • 5% increase in average availability of SaLTS primary surgical services across all hospitals • 22% increase in facilities performing C-sections* • 68% increase in facilities performing perforation repairs*
III. Surgical equipment & Supplies	Baseline to endline analysis of the Situational Analysis Tool	**Availability increased for 26 of 34 items.** • 11% increase in the average availability of OR items across all hospitals • 22% increase in facilities with oxygen concentrators* • 50% increase in facilities with OR light source*
IV. Surgical & obstetric providers	Midline to endline analysis of the Situational Analysis Tool	**Total increase of 40 providers across all hospitals.** • Facilities reported an addition of 3 IESOs, 2 OBGYNs, and 41 midwives, and a loss of 1 general surgeon and 4 surgeon subspecialists
V. Anesthesia providers	Midline to endline analysis of the Situational Analysis Tool	**Total decrease of 3 anesthesia providers across all hospitals.** • The facilities reported a total addition of 3 full-time BSc. anesthetists and 1 part-time BSc. anesthetists. • No anesthesiologists (physician anesthesia providers) were reported. • Accounting for this decrease is the loss of Level 5 Nurse Anesthetists (7 total lost) which had a statistically significant decrease ($p = .008$).** 5 Lv5 anesthetists reported at midline, versus none at endline.
VI. Ancillary staff	Midline to andline analysis of the Situational Analysis Tool	**Total increase of 54 ancillary staff anesthesia across all hospitals.** • The facilities reported a total addition of 1 radiologist, 9 BMETs, 22 OR nurses, and 22 pharmacists. • The number of Bio-Medical Technicians (9 added) and OR nurses (22 added) had a statistically significant increase ($p = .027$ and $p = .026$, respectively).**
VII. Surgical volume	Monthly Key Performance Indicator reporting	**4 of 10 hospitals showed a trend of increasing surgical volume.** • Average monthly volume per year (2016-2018, Tigray only): 29.8, 36.8, 34.5, respectively • Average monthly volume per year (2017-2018, Amhara only): 27.4, 31, respectively
VIII. Surgical referrals Out	Monthly Key Performance Indicator reporting	**8 of 10 hospitals showed a trend of increasing surgical referrals out.** • Average monthly referrals per year (2016-2018, Tigray only): 5.5, 9.4, 19.8, respectively • Average monthly referrals per year (2017-2018, Amhara only): 76, 74.4, respectively

*Statistically significant p<0.05, McNemar's Test
**Statistically significant p<0.05, Wilcoxon Signed Rank Test

Qualitative data collection was also incorporated into the evaluation framework to build a more nuanced understanding of the impact of Safe Surgery 2020 program.

Focus groups were conducted with approximately 75 staff across all 10 intervention hospitals in late 2018. Focus group data showed a largely positive perception of the impact of Safe Surgery 2020 program in both Amhara and Tigray intervention hospitals. While there were a number of barriers to implementation for most programs, there was almost unanimous agreement that each program had potential to sustain positive impact post-Safe Surgery 2020 intervention.

Most respondents felt a national-scale up of interventions could tremendously benefit other hospitals in similar need of improved surgical services. Throughout each focus group, there was enthusiastic discussion from participants about potential areas of improvement for each intervention; with these improvements addressed, they felt Safe Surgery 2020 could be even more impactful.

There are a few key themes that repeatedly emerged during discussions about specific interventions and as well as the general impact of Safe Surgery 2020 program:

→ Improved knowledge and skills of various aspects of surgical care, including sterilization, anesthesia care, and surgical data reporting

→ Greater teamwork and communication within surgical teams

→ Growth in individual accountability and ownership

→ Perception of overall improvement of clinical practices and surgical service delivery

There were also a number of gaps that focus groups participants highlighted:

→ Need for more substantive, ongoing clinical skills mentorship

→ Need for additional equipment and other technical training

→ Need for proactive involvement of RHBs and FMOH for sustainability

Several areas of positive impact as well as areas of improvement were noted and should be considered in any future scale up of Safe Surgery 2020 program and/or SaLTS programs. These suggestions are especially important to not only affect positive impact on surgery in Ethiopia, but to ensure its sustainability.

VI. RECOMMENDED PACKAGE OF INTERVENTIONS

Summary

Since 2016, SaLTS has collaborated with Safe Surgery 2020 to implement a diverse package of interventions.

A multi-pronged approach was used to improve overall surgical knowledge and skills, hospital infrastructure, and surgical data quality. This PIM highlights the core suite of interventions that have been piloted and are ripe for regional and national scale-up. Collectively, these interventions address the eight pillars of the SaLTS strategy.

Figure 3: Safe Surgery 2020 interventions mapped to the SaLTS pillars

4. Human resources

7. Quality of surgical anesthesia care & service delivery

A Anasthesia Training: World Federation of societies of Anesthesiologists

1. Leadership management and governance

8. Monitoring and evaluation

B Surgical Key Performance Indicators: Data Quality

1. Leadership management and governance

5. Advocacy and partnership

C Clinical Mentorship & Development of Leadership Capacity

4. Human resources

5. Advocacy and partnership

D Sterilization Training: Sterile Processing Education

E Bio-medical Engineering Technician Training

3. Supplies and logistics

4. Human resources

F Facility Accelerator Fund

2. Infrastructure

6. Innovation

G Oxygen and Pulse Oximetry Scale-up

2. Infrastructure

5. Advocacy and partnership

H Design & Administration of Hospital Assesment

8. Monitoring and evaluation

Expected outcomes from suite of interventions

The core interventions and activities described in this PIM are curated with the primary objective of creating long-term, sustainable impact on quality of surgical care in Ethiopia. The medium- and long-term objectives of the SaLTS/Safe Surgery 2020 collaboration are:

THEORY OF CHANGE

Long-term Impact
Increased Surgical Volume, reduced Referrals, reduced POMR and SSIs.

Medium-Term Outcomes
Improved Clinical/Technical Capacity, Enriched Teamwork & Communication, and Upgraded Quality of Data Collection Reporting

Short-Term Outcomes
Transfer of Knowledge and Skills to Local Facilities

Outputs

Staff	Stuff	Space	Systems
Leadership Mentorship WFSA ImPACT	FAF	SPECT	KPI Training BMET Clean Cut

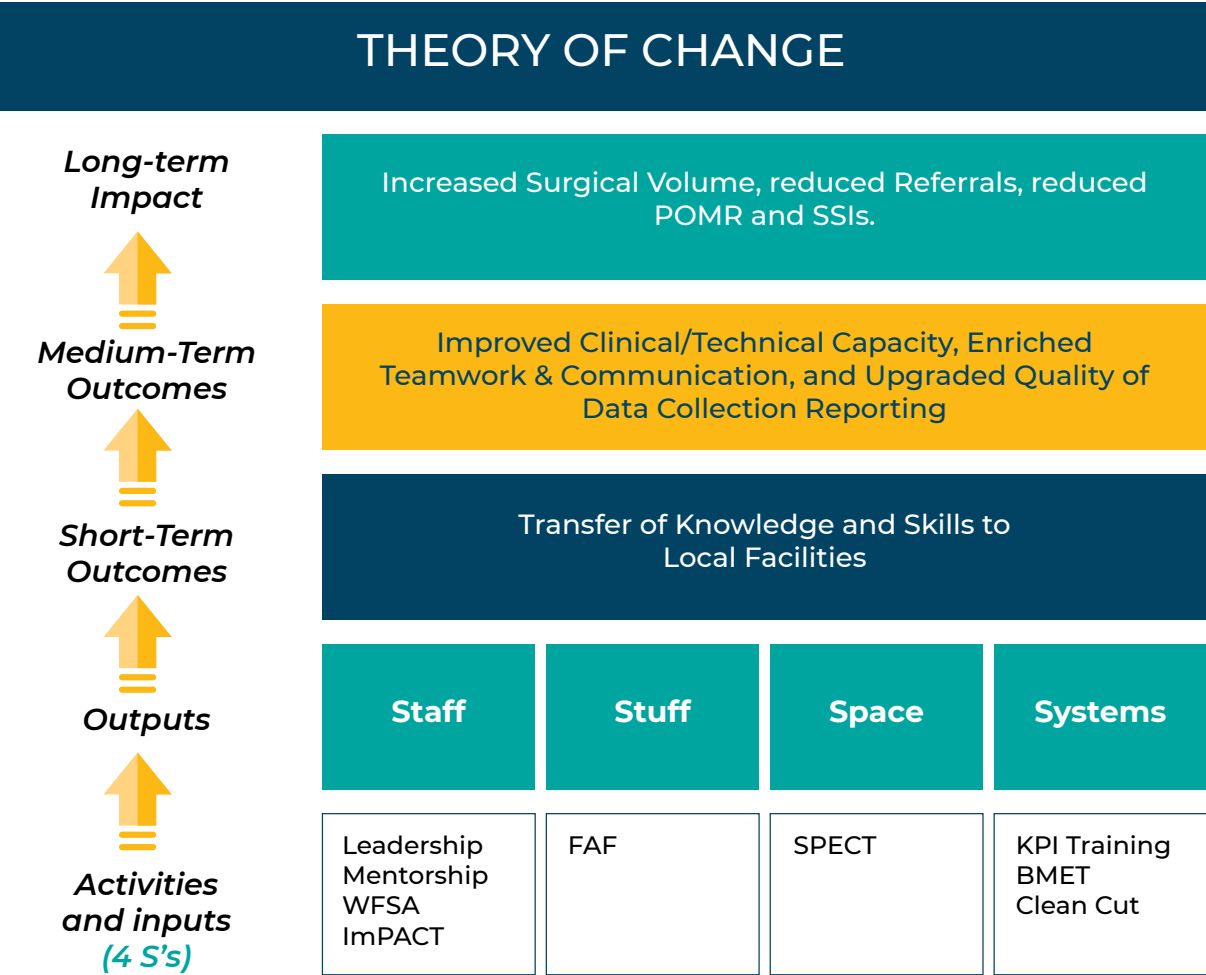**Activities and inputs (4 S's)**

Figure 4: Safe Surgery 2020 Ethiopia program theory of change

Description of the interventions

These proposed interventions are selected based on the demonstrated impact in limited settings and potential for rapid scale-up. Most interventions were implemented in 10 facilities in the Tigray and Amhara regions of Ethiopia as a package aimed at improving access and quality of surgical care. Some interventions have also been implemented separately in other regions. Available evidence shows that the interventions are complementary and mutually reinforcing. Therefore, although the interventions could be implemented separately, they are more impactful in transforming the surgical system when implemented together.

Intervention 1: Ethiopia SaLTS surgical assessment tool

Objectives

The primary objective of the Ethiopian SaLTS surgical assessment tool is to assess the gaps in the availability of emergency and essential surgical care (EESC) at all hospitals expected to be providing surgical services.

The tool is designed to be administered every 2-5 years to provide a long-term evaluation of Ethiopia's surgical system. Data collected from the surgical assessment tool will be used to inform policy, program planning, and project management of SaLTS implementation.

Expected Outcomes

It is anticipated that ongoing evaluation of the Ethiopian surgical system using the hospital assessment tool (HAT) will reveal changes and trends in capacity and quality of surgical care at the national level across eight domains. The data collected within each of these domains will be used to monitor and evaluate current activities and interventions implemented under the eight pillars of SaLTS. Furthermore, data will be used to identify gaps in the availability of EESC and guide the development and implementation of new SaLTS programs. At the hospital level, data will be used by hospital administration and surgical teams to assess the capacity and quality of surgical care at their facility in order to make improvements.

Description of Activities

Background and Tool Development

The WHO Situational Analysis Tool (SAT) is a validated facility-based surgical assessment tool consisting of 108 quantitative questions delineated by four domains: (1) Infrastructure, (2) Human Resources, (3) Interventions, and (4) Emergency & Essential Surgical Care Equipment and Supplies [5].

In August 2016, the FMOH SaLTS Project Team performed an initial assessment of surgical capacity with the WHO SAT and noted the tool required alignment to their SaLTS Monitoring and Evaluation policy. The Ethiopian FMOH, in collaboration with Harvard Medical School's Program in Global Surgery and Social Change (PGSSC), undertook the design of a modified WHO SAT as part of the Safe Surgery 2020 initiative (Figure 5).
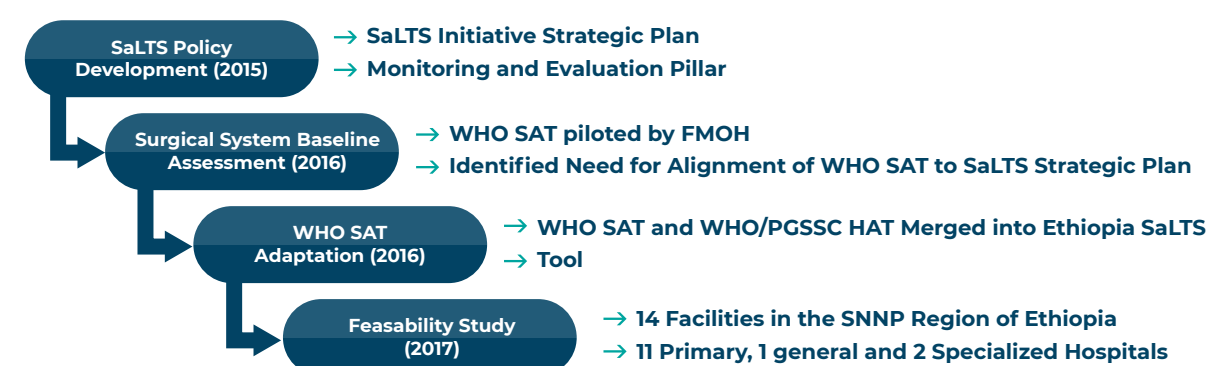

Figure 5: Process of Ethiopia SaLTS Tool Development.

The aim of the adapted tool was to evaluate the pre- and post-impact of SaLTS implementation and reflect the needs of the FMOH. This process involved integrating the WHO SAT with the WHO-PGSSC SAT that received two rounds of Delphi validation and expert vetting by the WHO [6]. Extensive input was also provided by the Surgical Society of Ethiopia (SSE) and the Ethiopian Society of Anesthesiologists to ensure contextual relevance.

Ethiopia's resultant assessment tool includes three hundred sixty-three quantitative and qualitative questions delineated by clinical provider and spanning eight domains: (1) General Information, (2) Infrastructure, (3) Human Resources, (4) Interventions, (5) Emergency and Essential Surgical Care (EESC) Equipment and Supplies, (6) Financing, (7) Information Management, and (8) Surgical Sets. Please refer to Annex 2 for a copy of the finalized Ethiopia SaLTS Tool [7].

(1) General Information

Questions in the general information domain remained largely the same as those included in the WHO SAT. Health facility categories were modified to reflect the terminology of Ethiopia's health system (health centers, primary, general, and specialized hospitals, and private, NGO, and mission hospitals).

(2) Infrastructure

The WHO SAT infrastructure domain investigates patient access to surgical services and the availability of operational resources, including: catchment population, admissions, bed availability, surgical volume; and availability of operating room (OR) equipment, running water, electricity/back-up electricity sources, management guidelines, and laboratory and imaging diagnostics, respectively. During the modification process, the laboratory diagnostics section was expanded to assess the availability of a Complete Blood Count (CBC) and full chemistry panel, all coagulation studies, an infectious panel screening and urinalysis, and blood. While the WHO SAT provided "Not available," "Sometimes," and "All the time" response choices, responses were changed to a more granular percentage scale to allow quantification of any improvement in capacity: 0% (Never), 1-25%, 26-50%, 51-75%, 76-99%, and 100% (Always). Additional short-answer questions were provided to understand which laboratory tests are often available and those typically unavailable, as providers may report they can never perform a full chemistry panel due to lack of an electrolyte panel, but always have Blood Urea and Nitrogen (BUN) and creatinine.

The imaging diagnostics section was similarly expanded to investigate the availability of an ultrasound, CT and MRI scanners, and 24-hour access to radiology imaging services. A short-answer section was provided to not only quantify available equipment, but to also assess which of these are regularly used, and, if not in use, why (non-functional, interrupted surgical services, etc.). Questions about usage were added to assess whether resources were being efficiently deployed.

The WHO SAT lacked questions pertaining to sterilization (CSR, autoclave) and transportation services (ambulance). Questions were added accordingly using the six-part percentage scale and short-answer framework. Questions on the availability of adult and pediatric pulse oximeters, blood pressure, and electrocardiogram (ECG) monitoring were also included. Surgical volume questions were stratified by the Bell-wether procedures, as recommended by the Lancet Commission on Global Surgery [8]. Finally, a section on use of the WHO Surgical Safety Checklist was incorporated to reflect the FMOH's mandate in the SaLTS plan to implement the checklist during all surgical cases.

(3) Human Resources

The Human Resources domain assesses the availability of qualified surgical, obstetric, and anesthesia providers, operating theatre nurses, and additional surgical team personnel. Anesthesia provider questions were stratified to reflect Ethiopia's human resources terminology (anesthesiologists, BSc. Anesthetists, M.S. anesthetists, level 5 anesthesia nurses, health officers, and general doctors providing anesthesia). Surgical team personnel questions were expanded to capture radiologists, pathologists, biomedical technicians, and pharmacists.

The workforce availability section was further delineated to illustrate the number of (1) full-time and (2) contracted (short-term) providers, and (3) residents/interns/trainees.

(4) Interventions

The interventions section measures the availability of surgical services presented by procedure. The list of surgical, obstetric, and anesthesia procedures on the WHO SAT was expanded to include 93 procedures to reflect the expected services provided within each facility level (health center, primary, general, and specialized hospitals) as defined in SaLTS policy. Columns were also added for reporting the approximate number of each surgical procedure performed monthly, and if the listed procedure is not performed, why not.

(5) Emergency and Essential Surgical Care (EESC) Equipment and Supplies

The EESC equipment and supplies section quantifies the extent to which capital outlays, renewable items, and supplementary equipment for use by skilled health professionals are available. An additional pharmaceuticals category was included for supply chain tracking, including: local anesthetics, general anesthetics, paralytics, sedatives, analgesics, benzodiazepines, diuretics, vasopressors, beta-blockers, steroids, and anti-emetics.

(6) Financing

The WHO SAT did not include any questions pertaining to finance, information management, or the availability of surgical sets. A finance section was integrated to measure the annual hospital budget allotted to surgery and anesthesia, availability of health insurance, and average out-of-pocket costs for the following: laparotomy, C-section, and open fracture repair (procedures only), CBC, X-ray, surgery-associated lodging per visit, emergency/elective patient and family transportation per visit, surgery-associated medication per visit (e.g. perforated), and other necessities per visit (e.g. laundry/food).

(7) Information Management

An information management domain was introduced to assess the method of hospital record keeping and responsible personnel, patient chart accessibility, data collection and reporting activities, availability of telemedicine, and the number of monthly quality improvement projects, ongoing research projects, and publications.

(8) Surgical Sets

A surgical sets domain was introduced to quantify the availability of complete and incomplete surgical sets for cesarean deliveries, laparotomies, and open fracture repairs. A short-answer framework was also included to answer the question: "If the surgical set is incomplete, what is missing?".

Intervention 1: Ethiopia SaLTS surgical assessment tool

General Modifications

An organizational modification was made to the tool to delineate questions by provider (hospital CEO/medical director; surgeon/IESO; OBGYN (surgeon/IESO if not available); and anesthesiologist/nurse) based on who would likely be most informed about the questions. The intent of this revision was to allow multiple data collectors to administer the tool simultaneously (e.g. surgical provider administers the section designated to the surgeon/IESO/OBGYN). When reviewing final versions of the adapted tool, questions with misleading language were rephrased to prevent erroneous reporting by providers.

Feasibility Study

Data was collected for the feasibility study in 14 public hospitals (2 specialized, 1 general, and 11 primary) in the Southern Nations, Nationalities and Peoples' (SNNP) Region of Ethiopia in February and March of 2017. Additional modifications were incorporated based on provider and data collection team feedback prior to finalizing the tool.

Implementation Lessons

The feasibility study was the first assessment of the Ethiopia SaLTS Tool and the first attempt to develop a tool for use as part of the national SaLTS monitoring and evaluation plan.

The tool's development was a collaborative effort with extensive input from the FMOH, SNNP RHB, Surgical Society and Ethiopia, Ethiopian Society of Anesthesiologists, Harvard PGSSC, Jhpiego, and local clinical providers. This multi-sectoral participation in the feasibility study improved awareness of the SaLTS initiative, enhanced communication and buy-in across multiple levels of the surgical system, allowed providers voices to be heard at each facility level, and instilled governmental accountability for addressing their needs.

Continued engagement with these partners will be beneficial to continue to improve the SaLTS Tool and methods of evaluation in the future. There are limitations to the tool, most importantly its resource-intensiveness in even the most dedicated surgical ecosystem. Implementation of the adapted tool at scale will necessitate methods that maintain the enhanced quality of data that the Ethiopia SaLTS Tool aims to capture. Although data collected with this tool is intended to be reported by the most informed providers, external validation of some indicators must be considered. Select data elements should be compared to those collected within Ethiopia's key performance indicator monthly reporting framework, particularly those that would be most useful for frequent monitoring at the facility level.

Recommended Implementation Approach

The Ethiopia SaLTS Tool is most effective as an evaluation tool when conducted as a semi-structured interview accompanied by verification with a hospital walk-through and operative logbook review. Approximately four providers are to be interviewed per facility using the specified sections of the SaLTS Tool. Expected study participants include:

1   Hospital leadership (CEOs, medical directors, and matrons)

2   Surgeons and/or IESOs

3   OBGYNs (Surgeon/IESO if not available)

4   Anesthesia providers (including mid-level providers) and/or OR nurses.

Interview with each provider is expected to last between 30 minutes and 2 hours and should be conducted by an unbiased data collector that is able to speak the local language or dialect. Responses are to be recorded on paper during the interviews and subsequently transferred to an electronic database for analysis. If a provider is unavailable during the on-site visit or further data clarification is needed, the data collection team should follow-up with emails and/or telephone calls.

Please refer to Annex 3 for the Ethiopia SaLTS Tool Implementation Training Manual.

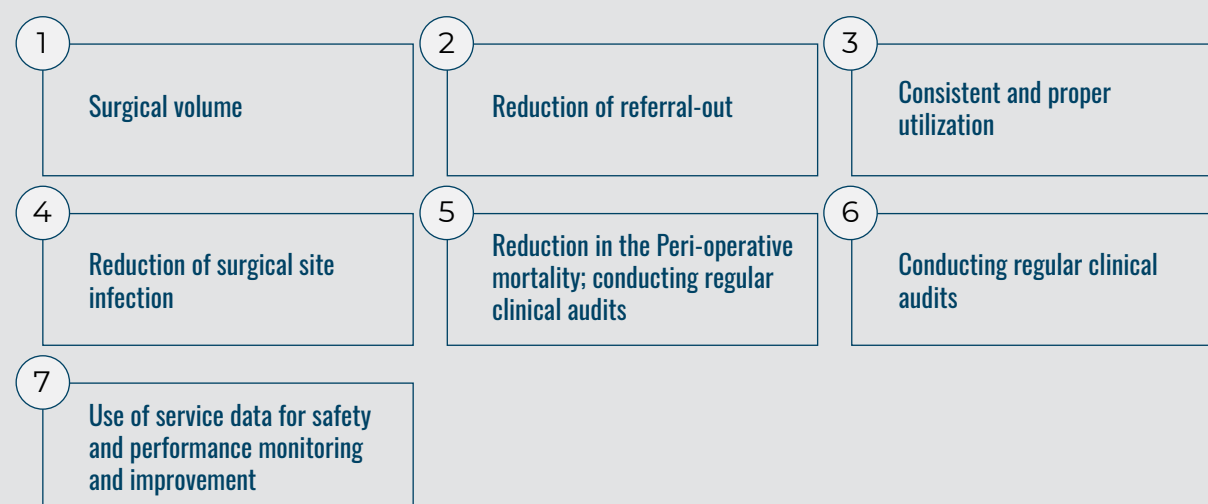# Intervention 2: Multi-disciplinary mentorship model

Objectives

The leadership and on-site mentorship program was implemented in the three regions of Ethiopia (Amhara, Tigray and SNNP). The program aims to equip hospital leaders and surgical team with core competencies needed to improve the surgical care ecosystem and performance.

Emphasis was given to quality improvement projects to enhance quality of clinical care and safety culture as well as agency that lead to more efficient practice through building teamwork, communication, and practice of recommended leadership behaviors. Jhpiego was the Safe Surgery 2020 lead partner for this intervention, working in close collaboration with the FMOH leadership, SaLTS team, regional health bureaus, local professional societies, and other partners.

Expected outcomes

The mentorship process was designed to impart and share knowledge, clinical skills, and leadership skills between mentors and mentees as well as promote inter-facility linkage and case referral between the lead hospitals and the mentee hospitals. The program continuously assesses progress towards results in the mentee hospitals and the overall benefits of SaLTS program. The key indicators used to measure resulting change through leadership and clinical skill capacity building in Safe Surgery 2020 project include:

1. Surgical volume
2. Reduction of referral-out
3. Consistent and proper utilization
4. Reduction of surgical site infection
5. Reduction in the Peri-operative mortality; conducting regular clinical audits
6. Conducting regular clinical audits
7. Use of service data for safety and performance monitoring and improvement

Description of Activities

At a national level, this intervention provided technical assistance to the FMOH Quality Directorate and particularly the SaLTS project team. To complement the institutional capacity building plan, a senior surgeon was seconded to the FMOH to support the SaLTS project team and consult the Quality Directorate and the SaLTS project team during policy formulation and review of the national surgical plan.

Safe Surgery 2020, through its partners, also participated in the SaLTS Technical Working Group (TWG).

At subnational levels, the mentorship model enhances clinical competencies of surgical team and surgical care system by deploying a team of multidisciplinary professionals mainly surgeons, obstetricians, anaesthetists and nurses—hence the term Multi-Disciplinary Mentorship Model (MDM).

1 Clinical mentorship training was provided to senior professionals from lead intervention hospitals that were selected on the basis of merit, attitude, and willingness.

2 Facility SaLTS committees were established to closely monitor the surgical team action plan and progress towards improving surgical care. Committees were accountable to the chief executive officer and involved members of the different management bodies and front-line health workers, including the surgical and anesthesia staff.

3 Mentorship visits were conducted by the multidisciplinary team of mentors. In each monthly visit, the mentors were expected to perform the following activities:

+ Provide on-site clinical skill training and technical updates to target surgical team
+ Conduct clinical consultation, patient visits, and ward rounds
+ Transfer skills using off-line tools and virtual skill transfer sessions
+ Conduct case-based discussions and need-based scientific dialogues
+ Share surgical system building skills including process efficiency improvement
+ Monitor functionality of the SaLTS committee and support areas for improvement
+ Promote a cohesive functional surgical team
+ Mobilize resources from lead hospitals, RHBs, and volunteer mentors to fill gaps in basic supplies critical for essential and emergency surgical care.

Implementation lessons and challenges

Comparison of program data collected during baseline and implementation confirmed that there were positive changes and improvements in the program result areas described above. The Safe Surgery 2020 project demonstrated that improvements can be achieved in access and quality of surgical care if:

→ Proper attitude is in place in all sectors of the service and stakeholders: the changes observed in the safety culture in the operating theatre, wards, and the overall involvement of the hospital leadership in attaining good outcomes is a clear indicator.

→ Training is provided for both the hospital leadership and surgical team: the evidence of engagement by officials at various levels is the support provided for surgical services in terms budget, material support, advocacy, staffing, etc.

→ Programming is adopted and owned by all stakeholders: Tigray and Amhara regions have already started to scale up the Safe Surgery 2020 model in other hospitals after reviewing the experiences and benefits of the project.

→ MDM is utilized with periodic supportive supervision: a mono-discipline model of mentorship was not effective to support the multi-disciplinary surgical team.

→ Adequate financial and material support is made available to ensure that surgical services run smoothly.

Lessons

Key lessons from implementation of the initiative include:

1 Primary hospitals with proper leadership training, basic staffing, and supplies can transform the current state of very low surgical access to a more equitable level.

2 Improving the safety culture in the surgical wards and operation theatres is achievable if trainings are given about the importance of safety and quality followed by regular mentorship.

3 Recommended leadership practices could be nurtured in facilities and regions where the leadership at all levels is engaged and motivates the surgical team to participate in data analysis and continuous leadership and quality improvement activities.

4 Tele-mentoring or distance mentoring can be considered as an innovative and cost effective way to support health facilities and staff that are not easily accessible.

5 Medical recording practices can be improved significantly when the hospital staff are made aware of the value of quality data in improving service delivery.

Challenges

The project performance has been challenged by factors both within and out of the control of the intervention. These includes:

→ Temporary conditions
  » Travel restriction from political instability and security concerns
  » Turnover of hospital leadership, mentors, and surgical team members

→ Weak quality management structures at RHB and hospital levels

→ Budget/finance shortfalls to scale up best SaLTS program practices

→ Ineffective mono-discipline (i.e. surgeons only) mentorship model was operational for most of the intervention lifetime

→ Managing expectation of the mentee teams

→ Problem solving skills are limited and the surgical team tend to externalize challenges and possible solutions to other stakeholders especially once the "low hanging fruits" are picked. For instance, while redistribution of surgical supplies between facilities is allowable, some facilities fail to make extra efforts to establish communication with nearby facilities to share locally available surgical supplies

Recommended implementation approach

Structuring the mentoring team

At the outset, the clinical mentorship was designed as mono-discipline approach to impart knowledge, skills, and leadership on surgical teams. However, observation during the mentorship process and supportive supervision visits, and the feedback from the mentee hospitals indicated the need for a multidisciplinary team

of mentors. To address this, the mentor team was reconstituted to comprise a surgeon, an obstetrician, an anesthetist, and a scrub nurse. The surgeon or the obstetrician was the designated team lead. Recently, the mentor teams were divided into two teams for each region having the same composition of surgical professionals per team (i.e. surgeon, obstetrician, anesthetist, and scrub nurse) to facilitate more mentor-mentee exposure time.
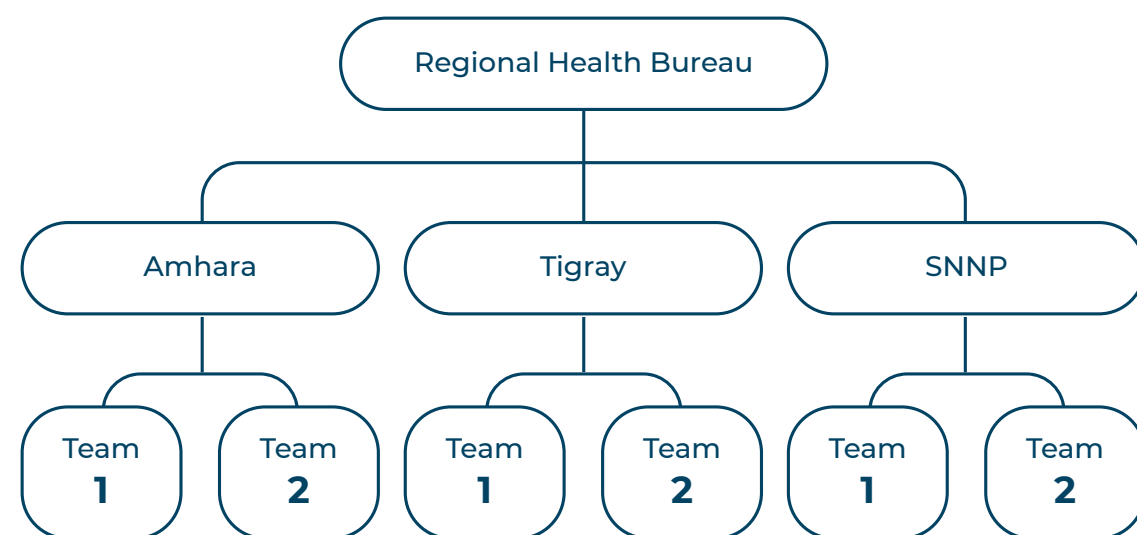

Figure 6: Multi-Disciplinary Mentorship Model for Amhara, Tigrai and SNNP Regions

Key points to consider in the above diagram:

1   The mentors in each region were divided into two teams

2   The team lead is a senior surgeon or gynecologist who has substantial experience in the safe surgery mentorship program.

3   The minimum team number is four and comprises of a senior surgeon, an obstetrician-gynecologist, an anesthetist, and nurse.

4   Each team is assigned to specific hospital taking into consideration factors such as travel distance, complexity, and previous acquaintance with the hospital etc.

5   Each team lead is responsible to coordinate the monthly mentorship visit and share the necessary reports with the Mentorship Advisor at Jhpiego (REDCAP, site level report and QIP status, audit report, case study, etc.)

Mentorship process

The mentors were recruited based on recommendation by the RHBs considering their experience, willingness, availability, attitude, and empathy. Subsequently, a mentorship training was provided prior to deployment to assigned hospitals. The mentors attended the leadership training with the mentee surgical teams to get acquainted to the mentees, the facility leadership, and the general ecosystem. At the leadership training, the mentors also collaborated with surgical teams to develop an action plan for their hospital. The mentorship visits have clearly set guidelines and deliverables that are communicated to the clinical mentors, giving due emphasis to the value of complete, quality, and timely collected data.

Information obtained during the mentorship and support supervision is collected in both paper and digital form (clinical mentors are provided with a tablet containing forms that are designed to match the paper copies). The digital input is accessible to the Jhpiego M&E office as soon as it is uploaded. A process map depicting the mentorship cycle is shown in Figure 7.

The trained mentors work hand-in-hand with hospital leadership and the surgical team to identify gaps (both in skills and theoretical knowledge) and

select areas that need to be addressed in the surgical ecosystem. They are also available to provide skill transfer both on-site and virtually. They assist the hospital leadership, SaLTS committee, and the surgical team to analyze facility level service data such as surgical site infection rate and coach them to design and implement quality and safety improvement projects.

Mentorship monitoring & evaluation

Mentorship and mentors evaluation tool

The objective of the evaluation tool (See Annex 4) is to assist the mentors in systematically conducting the mentorship process. It also serves as a way to capture critical information during the mentorship process that can be used for decision making by relevant stakeholders. Additionally, the mentorship tool assists in ensuring accountability for the interaction between the mentors and mentees. The tool has three parts: i) surgical system (activity implemented, challenges encountered in the month), ii) safe surgery practice (utilization of register, checklist and number of service, etc.) and, iii) feedback and comment section.

Mentors should use the tool during each mentorship visit to the hospitals. Before the mentor makes a site level

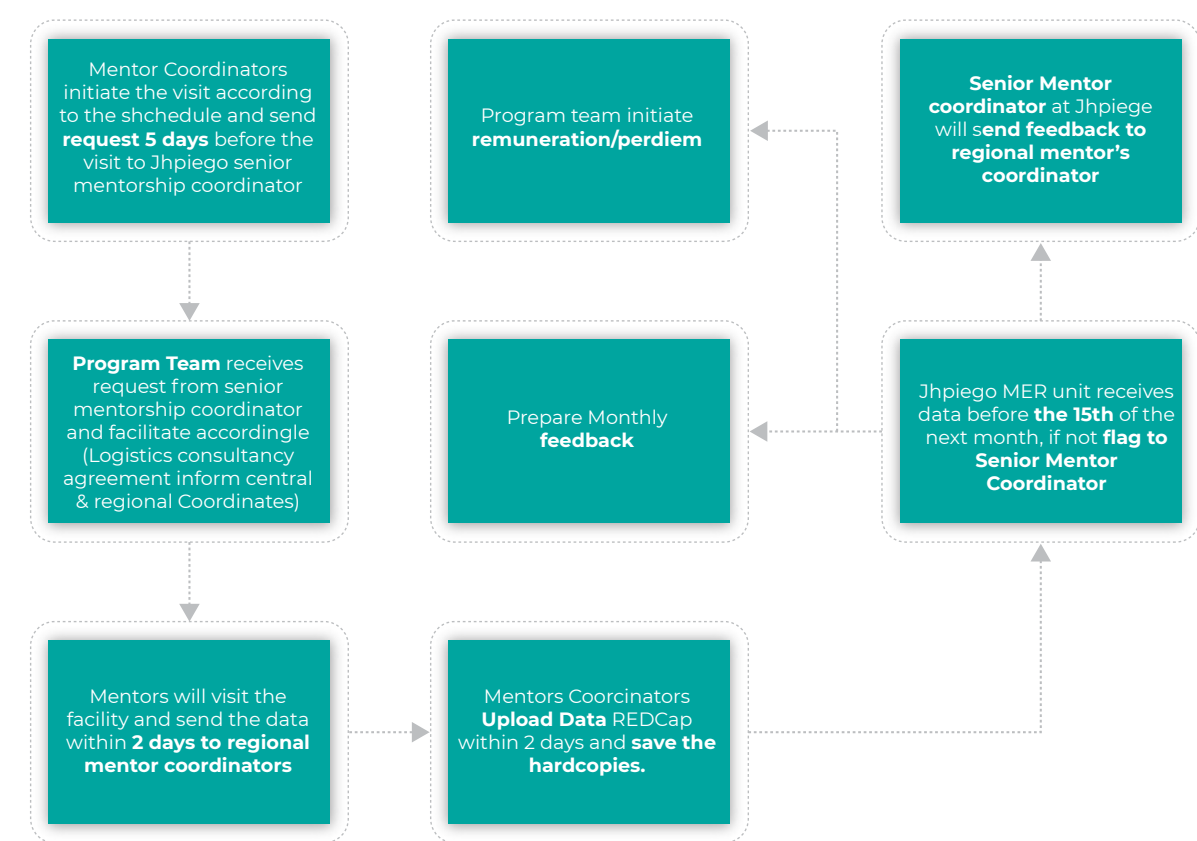Intervention 2: Multi-disciplinary mentorship model

Mentor Coordinators initiate the visit according to the shchedule and send **request 5 days** before the visit to Jhpiego senior mentorship coordinator

Program team initiate **remuneration/perdiem**

Senior Mentor coordinator at Jhpiege will s**end feedback to regional mentor's coordinator**

Program Team receives request from senior mentorship coordinator and facilitate accordingle (Logistics consultancy agreement inform central & regional Coordinates)

Prepare Monthly **feedback**

Jhpiego MER unit receives data before **the 15th** of the next month, if not **flag to Senior Mentor Coordinator**

Mentors will visit the facility and send the data within **2 days to regional mentor coordinators**

Mentors Coorcinators **Upload Data** REDCap within 2 days and **save the hardcopies.**

Figure 7: Data flow

visit, there should be advanced communication with surgical team members and the mentee hospital about the planned visit and to ensure availability of team members. At the end of the mentorship visit, the mentors are expected to provide constructive feedback at all levels, from the hospital leadership and surgical team, in accordance with the national SaLTS mentorship guidelines.

Once data is collected through tablets or on paper, it is transferred to centralised repository (at Jhpiego under the Safe Surgery 2020) as appropriate within two days after the end of the mentoring session. Stakeholders rely on reports from the

monitoring tool for timely and effective decision making. It is therefore imperative that mentors carefully utilize the mentorship tool when conducting each mentorship session. Mentorship Logbook

The mentorship logbook is the summary of the mentorship activity. The logbook requires the mentee surgical teams to reflect on each mentorship session and hence is filled with mentee surgical teams notes (See Annex 5).

Sustainability plan

The mentorship program implemented in Tigray and Amhara as part of the Safe Surgery 2020 project has clearly shown that the clinical and system mentorship can lead to more equitable, safe, and quality surgical care delivery. For sustainability, the following is required:

1   The mentorship plan should be fully integrated into the national and regional SaLTs program and appropriate resources allocated to implement and monitor the activities.

2   The mentor-mentee facility networking should be revisited by taking the current health tier system and cluster formation into consideration and leveraging available manpower and other resources.

3   FMOH and RHBs should utilize the trained-trainers (ToTs) produced through the Jhpiego-led leadership and mentorship program.

4   The mentorship should be designed in a more cost effective and innovative way to include tele-mentorship by leveraging available technology.

Intervention 3: Sterile equipment processing education

Objectives

Sterile Processing Education Charitable Trust (SPECT) provided education, training, and mentoring in selected Ethiopian hospitals with the objective of decreasing the risk of infection related to sterile processing techniques while improving knowledge and practices of sterile processing.

Expected outcomes

SPECT activities are expected to contribute to the reduction of risk of infection by improving sterile processing practices. Staff members who attend education classes and training will be able to increase their theoretical knowledge base and gain practical skills related to sterile processing. Furthermore, a Training of Trainers (ToT) model will allow for the training of qualified master trainers to enable them to continue training of other staff working in sterile processing in hospitals throughout their respective regions. This makes the training easily scalable.

Description of activities

Preparation

To prepare for implementation, SPECT educators met with RHB representatives in the Tigray and Amhara regions. The RHB representatives and hospitals supported by Safe Surgery 2020 selected hospital staff members to participate in SPECT training based on the guidelines for prospective participants. Representatives from each RHB also helped to identify a central location to conduct the training and assisted with coordination and logistics.

Key individuals were appointed by the RHB in each region to be involved in implementation. Additionally, a RHB representative accompanied the SPECT team on initial hospital visits to assist with introductions and administrative preparations.

Education

SPECT developed culturally appropriate educational materials and training resources. These were used to educate 65 staff members (36 from the Tigray region and 29 from the Amhara region) in 12 hospitals over a 3-day period in each region. Resources included PowerPoint slides, informational handouts, and posters. SPECT educators provided 48 hours of classroom education sessions focused on the fundamentals of sterile processing in each region. A variety of topics were covered during these sessions, including the basics of microbiology, infection prevention and control, cleaning and decontamination, disinfection, instrument assembly and packaging, surgical instrumentation, high temperature sterilization, and sterile storage. The SPECT Sterile Processing course curriculum is contained in Annex 6.

Training of Trainers

A 2-day ToT course was provided to 27 staff members from 23 participating hospitals including 12 hospitals supported by Safe Surgery 2020, 10 lead hospitals, and 1 additional hospital at the request of the RHB. Participants were paid a per diem as agreed upon with the RHB to cover cost of accommodation and food, and the daily salary for those required to travel. With additional mentoring, all trainers were expected to master sterile processing techniques so that they would be able to teach others. Each of the ToTs received all educational materials and training resources to be used to organize additional training sessions in their respective hospitals and regions. The SPECT Sterile Processing training material are contained in Annex 7.

Intervention 3: Sterile equipment processing education

Mentoring

A SPECT educator visited trained staff members at each participating hospital for 1-2 days to ensure that sterile processing procedures included the safe practices of cleaning, packaging, sterilization, and storage of surgical instruments in ways that could help decrease the risk of infection for patients. Knowledge and skills obtained by staff members during educational sessions were reinforced in the work setting through direct mentoring. The educator also provided hospital-specific recommendations for improvement as well as support for implementing changes to sterile processing practices. The educator also mentored trainers who had completed the ToT and were providing on-going training to local staff members.
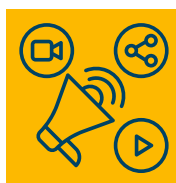
Advocacy

SPECT advocated with hospital administration in each of the Safe Surgery 2020 hospitals for increased access to basic resources for sterile processing, including brushes, detergents, and wrapping materials. Administrators at each hospital were also briefed on the hospital-specific goals for improvement that were developed by training participants from each of these hospitals, in order to acquire additional support.

The SPECT team also worked with Mekelle University to obtain ethics approval to conduct a small-scale research study on SPECT training. Initial hospital assessments were completed using the SPECT Hospital Assessment Form (Annex 8) at each Safe Surgery 2020 hospital prior to the training. Post-training assessments were conducted 5-6 months after initial assessments were administered. Results will be used to increase awareness of the need to address this area of health care that is often overlooked. As well, to address the importance of safe sterilization practices and demonstrate the impact of SPECT training at the hospital level.

Policy

SPECT educators worked directly with the Federal Ministry of Health to update the *Ethiopian Infection Prevention and Patient Safety Manual* to align national standards for sterilization with current WHO standards.

Implementation lessons

The activities implemented by SPECT proved to be beneficial in raising awareness of the clinical importance of practicing safe sterilization processes at the hospital, regional, and national levels in Ethiopia. Education, training, and mentoring enabled selected hospital staff members to gain knowledge and acquire skills that allowed them to improve sterilization practices at their hospitals. The training and increased awareness that participants took back to their work settings was evident in post hospital assessments, where significant improvements were identified in sterile processing practices as well as participant attitudes to their work.

Use of the ToT model proved to be effective in cascading SPECT training to staff members from throughout the Tigray and Amhara regions beyond the initial cohort of trainees. Follow-up with training participants indicated that over 200 hospital staff members had been trained by ToTs within three months of the initial training.

During implementation, it was determined that it was necessary to update the *Ethiopian Infection Prevention and Patient Safety Manual*. Outdated standards proved to be a major barrier to the implementation of WHO sterile processing recommendations used in SPECT education and training. It is important to ensure that standards are up-to-date and accepted by hospital administration and staff members in health facilities nationwide in order to enhance sterile processing practices.

Further contextualization of all training materials to the Ethiopian context is needed. While English is commonly spoken and understood within the medical community, it is recommended that all materials be made available in local languages for improved knowledge retention. Further, given that supplies were difficult to obtain in-country, it is important to procure the necessary resources for training (including all supplies and materials) well in advance.

Intervention 3: Sterile equipment processing education

Recommended implementation approach

Based on positive feedback from trained hospital staff members and increased commitment to practicing safe sterilization techniques in the selected hospitals supported by Safe Surgery 2020, the expansion of SPECT education, training, and mentoring to additional hospitals throughout Ethiopia is recommended.

Scale-up can be initiated through extension of the existing partnership between the FMOH and SPECT, which will allow for activities to be initiated in additional regions and hospitals throughout the

country. Implementation of SPECT programming at a national level can be facilitated by using the ToT model to train local, master-level trainers in each region to lead educational and training sessions, as well as serve as mentors.

In order for SPECT training to be contextually relevant and useful in Ethiopia in the future, it is important that the revised version of the Ethiopian Infection Prevention and Patient Safety Manual be disseminated to all health facilities in Ethiopia for immediate use. Hospital administration and staff members must be made aware of the updated standards for sterile processing and be supported in implementing changes within their facilities.

Intervention 4: WFSA training program

Objectives

The objective of the World Federation of Societies of Anaesthesiologists (WFSA) training programs implemented in Ethiopia is to sustainably increase the capacity of all levels of anesthesia providers to deliver safe anesthesia care for patients experiencing life-threatening obstetric conditions.

Utilizing a ToT model, WFSA also intends to produce well trained, master trainers that can continue teaching anesthesia providers throughout the country.

Expected outcomes

By providing specialized instruction through the SAFE Obstetrics Course, WFSA intends to increase the core knowledge and skills of anesthetists such that they are able to competently and independently manage common adverse obstetric conditions that arise during surgery. As the role of the anesthesia provider often may extend beyond the operating theatre, anesthetists will also become proficient in the emergency management of pre-eclampsia, resuscitation, pain relief, post-operative care, and in the high dependency care of critically ill patients. Additionally, WFSA intends to increase access to resources deemed essential in the delivery of safe surgical and anesthesia care.

Description of activities

In Ethiopia, a total of seven WFSA SAFE Obstetrics courses in three regions were conducted by experienced anesthesia providers such as anesthesiologists and senior, expert anesthetists. One hundred and sixty-one anesthesia providers from 52 hospitals received the training. Four SAFE Obstetrics courses were delivered in 2017 as part of the Ethiopia Anesthesia Capacity Development program, two in the Tigray region and two in the Amhara region.

The course material addresses the fundamentals of the core and extended roles of the anesthetist in managing obstetric emergencies. Clinical scenarios are used to teach participants about obstetric conditions that have been shown to cause approximately 80% of maternal deaths, including hemorrhage, sepsis, eclampsia, obstructed labor, abortion complications, anesthesia complications. Participants also learn about early newborn care, including resuscitation. The WFSA SAFE OB training material is contained in Annex 9.

Intervention 4: WFSA training program

Two ToT programs in each region were led by expert trainers, to enable participants who excelled in the SAFE Obstetrics course to learn how to deliver the training themselves. A total of 51 providers in the Tigray and Amhara regions became trainers, increasing the local capacity for training and education in obstetrics anesthesia. These providers included both physicians and non-physician anesthesia care providers, as determined by the Anesthesiology Society of Ethiopia and the anesthesia departments at hospitals involved in the training.

To ensure sustainability of this program, three SAFE Obstetrics fellows (practicing anesthesiologists) were recruited to ensure robust follow-up and ongoing support after implementation of the WFSA course. These fellows were based in Addis Ababa and Bahir Dar, Amhara. Fellows were responsible for meeting with course participants and trainers from both regions to measure knowledge retention and clinical skills, while also providing one-on-one clinical mentoring for six months. Additionally, one specialized-level hospital in each region was designated as a training hub (with an option for two hospitals depending on regional preferences) to provide continuing educational opportunities to anesthesia providers. Training hub(s) will be provided with equipment for training and receive the SAFE Obstetrics curriculum for their own use. Upon completion of the initial training program, WFSA signed Letters of Agreement with each RHB and hub hospital to continue offering the training program on a regularly scheduled time frame to ensure that there will be continuing medical education opportunities for anesthesia

providers in each region.

Six hospitals in each region (5 designated hospitals supported by Safe Surgery 2020 and 1 training hub) received Essential Anesthesia Kits (Annex 10) containing surgical and anesthesia equipment that are critical to the provision of safe surgery, anesthesia, and perioperative care. Training on the use of pulse oximetry and other equipment in the kits was provided, with the exception of capnography which will be completed soon.

Implementation lessons

Close collaboration with the RHBs in Tigray and Amhara was crucial to the success of the Safe Surgery 2020-funded SAFE Obstetrics courses. It is necessary to maintain constant communication with RHBs and hospitals to ensure that the trainings are organized well in advance and prospective participants are able to attend.

The logistics of delivering equipment was a time and resource intensive process in Ethiopia, indicating that it will be important to begin the procurement process earlier and factor in unexpected costs during future courses. There is currently a widespread shortage of anesthesia providers in Ethiopia, particularly in rural areas. It is necessary to plan to provide replacements for anesthetists that are serving as the sole anesthesia provider in certain hospitals, so that they are able to attend all days of the SAFE Obstetrics course without interrupting normal service delivery.

Feedback from trained anesthesia providers suggest that many would prefer continued skills training following the three-day course, as many participants felt that more time was needed with expert trainers to master these skills and information. SAFE Fellows may be able to provide this support, but it is necessary to recruit fellows as early as possible so that they are able to attend as many courses, provide evaluation, and offer mentorship as much as possible during their fellowship.

Partnerships with national professional societies were incredibly beneficial to this program, particularly in connecting with local physician anesthesia expertise and leadership. These partners will be fundamental in ensuring the sustainability of the training program.

Recommended implementation approach

Continued implementation of the WFSA Safe Obstetrics courses will help provide much-needed training to anesthetists and other anesthesia providers working in Ethiopia.

Expansion of this course to other hospitals in the country is possible through continued cooperation between the FMOH and WFSA. Future courses should employ the ToT model to train local experts that can lead educational and training sessions and assist in long-term follow-up, along with the SAFE Fellows. If possible, it is recommended that the FMOH also explore additional training from WFSA that will provide trainees with more in-depth education and additional skills practice.

Intervention 5: Facility Accelerator Fund

Objectives

The Facility Accelerator Fund (FAF) is designed to support partner health facilities address identified gaps in surgical capacity. Small grants provided by the FAF are meant to allow clinical teams address a self-identified barrier to providing safe surgical services. The surgical leadership teams identify and prioritize gaps that inhibit safe surgery and, with support from the FAF, are able to implement interventions that result in improved surgical outcomes at their facilities.

Expected outcomes

The FAF is expected to provide an opportunity for surgical teams to work together in identifying and addressing barriers to providing care at their hospitals. FAF funding will enable hospitals to independently procure equipment and/or make infrastructure improvements that will help to improve surgical services.

Description of activities

The availability of the FAF grants was announced to selected hospitals supported by Safe Surgery 2020 in 2016. In order to receive a grant, surgical teams at each hospital were required to work together to identify and develop a solution to a problem at their hospital that was affecting their ability to provide safe, high-quality surgical services. Guided by mentors working with the Jhpiego Safe Surgery 2020 leadership and mentorship program, each surgical team wrote a grant proposal detailing a surgical quality improvement project for submission to Assist International for review. Each proposal was expected to contain an explanation of the issue being addressed and the plan for improvement, as well as an anticipated timeline and budget for the project. The FAF Information and Application Guide is contained in Annex 11.

Upon review and approval of each proposal, surgical teams were awarded a grant of approximately 10,000 USD or the equivalent in medical equipment, to be used for implementing their quality improvement projects.

In Ethiopia, Assist International provided grants to ten hospitals in the Amhara and Tigray regions. In Amhara, funding was used to help improve a number of infrastructure issues in Addis Alem Hospital including: retiling of an operating room, fixing plumbing and drainage systems, providing touchless sinks, and constructing a recovery room with outside access separate from the operating theatre. Three GE VScan Access and two GE B40 patient monitors were purchased for hospitals in Amhara. In the hospitals located in Tigray, five GE Carestation anesthesia machines were purchased with FAF funding. All equipment purchased with grants were accompanied by clinical and technical training provided by a certified GE trainer and a 3-year service contract to help address any issues that may arise. Funding was also used build a new recovery room at Lemlem Karl General Hospital in Tigray.

Implementation Lessons

The FAF program provided surgical teams with an opportunity to work together to identify, find a solution, and address a specific challenge in surgery and anesthesia care at each of their respective hospitals. The flexibility of the FAF program enabled surgical teams to independently plan and implement an intervention that had the potential to make an immediate impact on their work.

In providing these grants to selected Safe Surgery 2020 hospitals in Tigray and Amhara, the terms of the grant were open-ended (i.e. proposal guidelines were general and no expectations were set for how funding was to be used at the hospital level). This allowed each hospital to individualize their quality improvement project without limitation.

The submitted proposals were intended to allow different surgical teams to use funding to address issues that they had identified at their hospitals. In future implementation, it may be beneficial to ensure that teams understand that their use of the FAF funding is up to their discretion, once their proposal is approved. It is also important to communicate expectations and a timeline for the grant application process. Mentorship from individuals who are well-versed in grant writing and quality improvement project development is a critically important part of this program. Once funding is distributed, it is recommended that follow up be done at each hospital to ensure that funding is being utilized effectively and appropriately. Continued support from hospital administration is also crucial to the long-term success of the improvement project.

Recommended Implementation Approach

Scale-up of the FAF program will be relatively straightforward at a regional and even national level in Ethiopia. The number of grants available and amount awarded for each grant should be determined before accepting applications. Implementation should be managed by a designated point person, while the review and selection of awardees should be conducted by a qualified committee. Additional funding for the grants will initially need to be secured; possible sources of funding may include internal funding at each hospital, international partner organizations and donors, RHBs, and the FMOH.

Intervention 6: ImPACT Ethiopia

Objectives

The ImPACT Anesthesia Training Program in Ethiopia is designed to improve the safety of anesthesia and perioperative care by enhancing education and training for nurse anesthetists in the Tigray and Amhara regions of Ethiopia.

Using a combination of powerful training tools, the program is designed to equip trainees with essential skills of anesthesia, research, ethics, and professionalism. The program is designed to enhance, but not replace, the anesthesia curriculum in Ethiopia. It includes a Learning Management System (LMS), training of trainers program, novel data collection tool, and simulation package. These innovative curriculum enhancement tools are designed to improve both the quality of education at the training institutions, and the quality of anesthesia care within the referral network.

Expected outcomes

Two fully equipped anesthesia training hubs at a university and teaching hospital will be founded in each region to enhance the national anesthesia curriculum for nurse anesthetists, promote the collection of anesthesia-specific data, and establish a mobile simulation program for team training in the management of obstetric and neonatal emergencies. Overall, this program is expected to provide nurse anesthetists with additional education and training that will allow them to develop essential skills in anesthesia care, research, ethics, and professionalism.

Description of activities

In collaboration with the RHBs, the ImPACT program will establish two training hubs in the Tigray and Amhara regions. These hubs will be hosted by specialized-level hospitals and local universities in urban centers and expected to provide education and training for anesthetists throughout the region.

Each hub will include the following:

Intervention 6: ImPACT Ethiopia

Enhanced Education Capacity

A Learning Management System (LMS) will be introduced to augment the national anesthesia curriculum for nurse anesthetists. The LMS is a novel system that includes didactic lessons leveraging the modern principle of 'flipped classroom' learning and case-based classroom discussions— this combination is known to increase acquisition and retention of knowledge. It should be noted that the LMS is not intended to replace the national curriculum for accreditation, but is rather an innovative way to enhance the current learning system.

The LMS was developed with a hardware platform that does not require internet connectivity, enabling students to access content including over 140 online lectures covering core clinical anesthesia topics and over 50 case discussions at any time. Educators and trainees are given tablets that will connect to the server if within a 3-5 kilometers radius, allowing for 24/7/365 access to lectures and other curricular components at no cost. Access to these training materials requires a unique ID, which allows for tracking of usage for monitoring and evaluation purposes.

ImPACT also run a ToT at Kijabe Hospital in Kenya to provide selected anesthesia experts from Ethiopia with intensive training in curriculum delivery, student assessment, clinical and didactic interactive classroom environment development, and simulation training. During this training, Dr. Mark Newton of Vanderbilt University provided full-time supervision of these efforts for current cadres of trainers. Funding was provided for all travel and lodging expenses for 9 master trainers—3 from Tigray region, 3 from Amhara region, and 3 appointed by the Ethiopian

Society of Anesthetists (EAA)—for purposes of scaling the program nationally.

Data Collection

A novel tool using REDCap technology has been developed for optional function in environments with limited access to internet. This tool allows for offline data collection by trained anesthesia providers using tablet computers with intermittent data uploads when internet access is available. Data collectors use RedCAP to collect patient information that when aggregated, can provide information on the types of surgeries being performed, the types of anesthesia being provided, and the types and frequency of surgical complications. Electronic files are safely stored in a secure server for efficient analysis.

Recommended Implementation Approach

The ImPACT program was recently initiated in Ethiopia and activities are currently in progress. A total of 9 master trainers have completed training at Kijabe Hospital and are prepared to train other anesthesia providers with the support of twelve in-country educators that will be trained during the first year of implementation. It is expected that these educators will increase the capacity to provide high-quality anesthesia training in the Tigray and Amhara regions.

Updates regarding outcomes, lessons, and the recommended approach for scale-up will be provided upon completion of this program.

Intervention 7: BMET training

Objectives

Non-functioning medical equipment causes delays in care, increases risk for patient safety, and has implications for the environment. The lack of functional medical devices in Ethiopia have been cited as a problem by the FMOH, RHBs, as well as staff at local hospitals.

The impact of broken devices on the Ethiopia health system has, however, not been rigorously evaluated largely in part due to the complexity involved in designing such a study. The objective of the biomedical engineering training program is to provide comprehensive skills training for qualified biomedical technicians through education, practical and professional experiences, and mentorship.

Expected outcomes

By increasing the practical skills and theoretical knowledge of BMETs, it is anticipated that they will be prepared to: (1) train other BMETs, and (2) independently maintain surgical equipment in their respective hospitals and regions. Furthermore, by enhancing health technology management (HTM) and institutionalizing HTM practices at a regional level, BMETs will be better able to provide support for clinical users.

Description of activities

This intervention consists of a module-based training program and mentorship for qualified BMETs, a training-of-trainers course, monitoring and evaluation activities, and the development of regional Centers of Excellence Biomedical Workshops ("Workshop").

Intervention 7: BMET training

Training and Mentorship Program

All BMETs involved in this intervention received training in a comprehensive 8-week training program led by qualified instructors. The program trained on the following 9 modules:

➜ Professionalism
➜ Oxygen Concentrators
➜ Autoclaves
➜ Suction Pumps
➜ ESU
➜ Anesthesia Machines
➜ Ventilators
➜ OR Lights
➜ Patient Monitors

The Facilitator's Guide for the OR equipment maintenance skills course is contained in Annex 12. After completing the training, participants received either direct or remote mentorship from the program lead and program instructor.

Every BMET also learned how to use the Work Order Tracker tool created by Assist International (Annex 13). This tool allows BMETs to document inventory and work performed on equipment.

Training of Trainers

Six BMETS from the Amhara and Tigray regions of Ethiopia completed an 8-week training (described above), with the addition of one pedagogical unit. Upon completion of the program, each trainer was given the assignment of taking inventory of medical devices at program hospitals and planning a workshop at sites selected by the RHBs and Felege Hiwot Hospital in Amhara Region. The ToT cohort received mentoring from the program lead and

program instructor at their respective facilities.

The on-the-job mentorship was designed around three key facility-based assignments – completion of hospital inventory, tracking work order, and creating preventive maintenance schedules. The program instructor also provided a refresher training on medical device test equipment and review of the teaching materials.

Trainers will teach or co-teach a cohort of up to 15 BMETs in both the Amhara and Tigray regions (i.e. multiple Tigray trainers work together to teach a cohort of Tigray BMETs) at the regional Workshops. Each cohort will receive a 1-week training that covers all of the material the trainer cohort learned. Cohorts will have the opportunity to ask questions and receive guidance from the program lead and program instructor through Telegram, a cloud-based instant messaging and voice over IP platform that will facilitate communication between trainers, trainees, program lead, and program instructor.

Each trainer subsequently will lead trainings for cohorts of up to 15 BMETs until a collective total of 270 BMETs are trained within the Amhara and Tigray regions.

Monitoring and Evaluation

Data collectors were hired to collect data using the Work Order Tracker tool at each program hospital. The collection of data is in progress and will be shared with the RHBs in both Amhara and Tigray when complete. This data can be used to monitor the productivity and impact of BMET work as a result of this training program.

Centers of Excellence Biomedical Workshops

Two workshops are being established in the regions (1 in the Amhara region and 1 in the Tigray region) by Assist International for use during the training programs. Each Workshop is outfitted with test equipment and tool kits for use by local BMETS and intended to allow BMETs to continually maintain medical equipment in the region. The RHBs in Amhara and Tigray agreed to replicate the Workshops such that each region will have a total of two Workshops.

Implementation Lessons

The training program has successfully trained six BMET trainers in Amhara and Tigray regions. Partnership with the RHB and FMOH proved to be critical to the successful implementation of this program. Open communication and collaboration between all involved partners will be required as program activities are expanded to new hospitals and regions.

Additional planning will be necessary in order to scale this training program nationally. Prior to implementation, approvals for the training curriculum should be obtained from the appropriate levels (national, regional, local, etc.). The implementation workplan must be adapted to keep progressing despite changes in key leadership the FMOH, RHBs, and program hospitals. If monitoring and evaluation activities will be conducted, it is recommended that data collectors be contracted before or early on in the implementation process. It should be noted that international procurement of materials will require extra time for shipping and delivery. The on-the-job mentorship requires cooperation from leadership at hospitals to hold the BMETs accountable with the assignments. If the assignments aren't completed as instructed, it is difficult for program lead and instructor to provide feedback.

Intervention 7: BMET training

Recommended implementation approach

Led by Assist International, the implementation of this training program was dependent on the success of the initial training-of-trainers and replication of training and mentorship activities by the trainers throughout the selected regions. The program lead and program instructor of any future trainings must be qualified to conduct trainings and provide mentorship to professional BMETs.

Assist International partnered with AATPC (Addis Ababa Tegbared-Id Polytechnic College) to implement the initial 8-week training of the trainer. GE Foundation invested in BMET training labs and classrooms and these sites were used to provide both theoretical, and lab-based practical courses. The clinical attachment component of the training was organized at ALERT (All Africa Leprosy, Tuberculosis, and Rehabilitation Training Center) where a Center of Excellence Biomedical Workshop was established by GE Foundation and partners to improve biomedical engineering practice in Ethiopia.

To implement the intervention as described, it is recommended that ToT participants be brought to a central location where there is a Workshop or other health facility that is able to provide the resources necessary for all training activities. For example, students trained as part of the Safe Surgery 2020 initiative were brought to Addis Ababa to receive eight weeks of specialized instruction. AATPC can host and train other BMETs from additional regions to serve as trainers in other regions. Workshop plans will be made available upon request for duplication by RHBs.

Regional trainings should be conducted by trainers who have successfully completed the ToT course. RHB involvement is strongly recommended, especially in the development of new Workshops.

Intervention 8: Clean Cut program

Objectives

Clean Cut is a 6-month intensive, facility-based intervention that uses the WHO Surgical Safety Checklist to engage surgical providers – including surgeons, anaesthetists, and theatre nurses – to commit to improved compliance with six critical infection prevention standards:

1   Skin and hand decontamination,

2   Maintenance of the sterile field,

3   Antibiotic timing and selection,

4   Sterility of instruments,

5   Surgical gauze counts,

6   Use of the WHO Surgical Safety Checklist.

The aims of this intervention, called Clean Cut, are to: 1) improve compliance with critical standards of perioperative infection prevention, and 2) reduce deaths and complications from surgery in a scalable, sustainable fashion.

Expected outcomes

Clean Cut's primary expected outcome is to improve surgical safety practices resulting in a reduction of surgical infections. Through its checklist-based, team-centered methodology, Clean Cut will also reinforce effective implementation of the WHO Surgical Safety Checklist in Ethiopia thereby improving the overall perioperative process.

Intervention 8: Clean Cut program

In the long-term, the program is intended to be scaled across all facilities performing surgery throughout Ethiopia. Scaling of this program will help strengthen the process of quality improvement, build local capacity, and lead to in-country expertise in checklist implementation – all in support of the goals of the SaLTS program to improve the safety and accessibility of surgery and anesthesia in Ethiopia.

Description of activities

In collaboration with the Ethiopian FMOH, Lifebox developed and introduced the Clean Cut program in January 2016 at Jimma University Specialized Hospital (JUSH) with support from GE Foundation. With support from the FMOH and GE Foundation, Lifebox expanded the Clean Cut program in 2018 to two teaching hospitals in Addis Ababa in order to build on the experience at JUSH and refine the Clean Cut program for eventual expansion throughout Ethiopia and to other contexts. The program has also been implemented at four additional hospitals in Ethiopia to date: Black Lion Hospital (funded separately by Lifebox), Menelik II, St. Peter's Specialized Hospital, and Fitche General Hospital. Clean Cut has already begun to demonstrate substantial improvements in the safety of surgical care in these facilities.

To ensure that the program functions at a facility level, the following organizational strategy was utilized for management and leadership of the program.

→ A lead surgeon designated at each site was present full-time to provide oversight and maintain program momentum while coordinating all site-specific program activities.

→ A head OR nurse served as the operations and quality lead at some facilities; remaining facilities relied on a Quality Improvement Director.

→ Data collectors (typically operating theatre and ward nurses) were hired and received financial compensation for direct observation of processes in all perioperative areas including pre-operative waiting areas, recovery units, sterile processing and storage, post-operative wards, and the operating theatre. These data collectors were also responsible for regularly reporting specific findings to the Clean Cut team.

Clean Cut implementation consisted of three successive and interconnected phases. First, the lead surgeon engaged with the surgical team (consisting of surgeons, anesthetists, and OR nurses) in order to establish team commitment to improving perioperative care. Second, a hospital assessment was completed to determine the

current level of compliance to standards, tack the outcomes of surgical care, and inform the mapping of upstream processes affecting these standards. The hospital was responsible for creating process maps that demonstrated how to manage this intervention internally. Third, the program promoted process improvement by educating the surgical team in identified gaps and process weaknesses at their hospital that reduce compliance with standards; in turn, this knowledge was used to help the team identify solutions. In matching the process maps with specific compliance failures, the surgical team was able to identify barriers to adherence and make changes that supported improved compliance.

SPECIFIC CLEAN CUT TEAM MEMBER RESPONSIBILITIES:

→ Surgeon Clinical Lead: Leads engagement of the surgeons and the surgery department engagement

→ Anesthesia Clinical Lead: Leads engagement of the anesthetists and anesthesia department

→ Quality Improvement Manager: Engages QI team and is responsible for project sustainability

→ OR Manager: Evaluates and identifies gaps in operating room procedures, equipment and workflow

→ OR Nurse(s): Promote adherence to perioperative standards and perform data collection

→ Ward Nurse(s): Perform postoperative follow up, patient education, reporting of complications

→ Hospital Administrator: Provides support for the work and is responsible for promoting system-wide improvements

→ Ancillary Team Members: Other hospital administration and staff are encouraged to engage with Clean Cut for improved understanding and implementation of process changes

Intervention 8: Clean Cut program

Ongoing assessment of the level of compliance and surgical outcomes were used to track progress and reassure the team that improvements were occurring. Process measures include hand and surgical site antisepsis, sterile draping and integrity of the sterile field, appropriate instrument decontamination and sterilization, appropriate timing and use of peri-operative antibiotics, routine surgical swab counts, and routine use of the WHO Surgical Safety Checklist. In line with the SaLTS KPIs, outcome measures for this program included surgical infections, post-operative mortality, length of stay, and need for reoperation. Data was collected using paper data collection tools and entered manually into Excel to share with the Lifebox Clean Cut team. Data was aggregated and analyzed on a monthly basis for reporting back to hospitals and used to generate new process improvement solutions. For future program implementation a mobile data collection platform has been developed using DHIS2 that can be easily integrated into current Ethiopia FMOH DHIS2 program if desired.

Implementation Lessons

Organizational strategy is an important aspect that should be planned well in advance of implementation to ensure that this program is successful. The lead surgeon should be a practicing clinician who is able to be regularly present in the hospital, handle administrative responsibilities over theatre operations and staff, and who models compliance with the WHO Surgical Safety Checklist.

The head OR nurse should be a respected, experienced supervisor who fully understands perioperative processes and standards and who can organize improvements in process compliance. Data collectors should be existing hospital personnel who are familiar with operating theatre practice and etiquette and are able to commit to directly observing how processes occur in all peri-operative areas. It is important that these personnel are not rotated to different positions or transferred to other facilities during the course of program implementation.

Recommended Implementation Approach

The Clean Cut program at the initial five pilot hospitals has resulted in enhanced compliance with infection prevention and control standards. Activities in the upcoming year will prepare this program for further adaptation and expansion to additional hospitals in Ethiopia in the future. A full guideline for implementation of the Clean Cut program is in the process of being finalized and will be made available to the FMOH once completed.

Intervention 9: KPI data intervention

Objectives

The objective of this intervention is to implement a system of surgical registers at hospitals in order to aid collection of high-quality surgical data, including national SaLTS Key Performance Indicators (KPIs). This will contribute to addressing the need for high-quality surgical data across Ethiopia.

Expected outcomes

Implementation of this intervention is anticipated to yield ongoing collection and reporting of SaLTS KPIs from hospitals to regional and national levels on a prospective, monthly basis. The proposed suite of registers will allow facility-level collection of all data elements needed to calculate 11 of the 15 KPIs; the remainder of which require use of patient surveys or human resources records.

The following KPIs can be collected via registers implemented in this intervention:

→ Surgical Volume

→ Peri-Operative Mortality Rate (POMR)

→ Rate of Safe Surgery Checklist Utilization

→ Surgical Site Infection (SSI) Rate

→ Anesthetic Adverse Outcome Rate

→ Delay for Elective Surgical Admission

→ Mean Duration of In-Hospital Pre-Elective Operative Stay

→ Blood Unavailability Ratio for Surgical Patients

→ Surgical Bed Occupancy Rate

→ Rate of First Elective Case On-Time Theatre Performance

→ Rate of Cancellation of Elective Surgery

Collection and reporting of these indicators, several of which are already included in the current HPMI framework, will help further surgical monitoring and evaluation activities in support of SaLTS Pillar Eight.

Description of activities

The KPI Data Intervention intervention was piloted over a period of eight weeks in each region. Implementation was first carried out in the Amhara region, followed by the Tigray region shortly after conclusion of the intervention period in Amhara.

Following an initial assessment of data collection practices at intervention facilities, PGSSC developed a set of seven hospital registers based on existing FMOH registers to aid collection of indicators (see Annex 14).

1 Operation Room Scheduling Register

2 Operation Register

3 Anesthesia Logbook

4 Inpatient Admission/Discharge Register

5 Surgical Ward Register

6 Referral Register

7 Surgical Site Infection Logbook

This intervention consisted of the following activities:

WEEK 1 (PART I):
Training of Trainers (ToT) consisted of a two-day training of local clinical mentors, as well as other data quality trainers involved in the intervention. Participants were trained in several areas, including surgical M&E, collection and reporting methods for indicators, and their role supporting hospitals in intervention activities

WEEK 1 (PART II):
Training of Providers immediately followed the ToT with a two-day training of hospital teams. Participants included surgical team members (IESOs, anesthetists, OR nurses), ward nurses, liaison officers, and hospital leadership (Medical Directors and CEOs) from intervention hospitals. Training topics included global surgery, M&E, intervention indicators, and completion of intervention registries (see Annex 15). Education on selected intervention indicators of focus was enhanced by small group activities such as case studies intended to provide more detailed instruction of these indicators.

WEEKS 2-8:
On-site Visits continued the remaining seven weeks of the intervention. PGSSC, local clinical mentors, and study supervisors visited intervention hospitals on a regular basis to provide further training, support, and feedback regarding the data collection system and indicator collection and reporting. Activities conducted during these visits primarily included ensuring adoption and accurate use of new registries, direct observation of Safe Surgery Checklist use, and performing standardized data quality checks (see Annex 16). The visiting teams also ensured completion of and collected both weekly and monthly KPI reporting forms at these visits.

An Analysis and Reporting Workshop was conducted within the month following conclusion of the intervention period. This one-day workshop gathered the hospital teams to share their indicator data and experiences with the new data collection and reporting system (see Annex 17).

Implementation Lessons

The new system to standardize surgical data collection was successfully piloted in the Amhara and Tigray regions. Collection of the SaLTS KPIs is feasible using such a system, especially accompanied by structured regional and on-site training for all members of the surgical team. Main lessons learned from this intervention support the feasibility and utility of the standardized surgical data collection system.

The new registries were well received and utilized by the appropriate member of the surgical team following training. Further on-site visits by mentors solidified understanding of the registries, indicating the importance of continual training and data quality checks of the registries. A review of reporting forms from all intervention hospitals has indicated that these registries are appropriate to capture standardized surgical data.

The success of an intervention of this type depends on the involvement of key stakeholders. Within this pilot phase, the support and engagement at both national and regional levels of the government and expertise by local and international partners were integral to our results. The mentorship and guidance of the local clinical mentors in providing on-the-ground support to hospital teams allowed for better understanding of the new system and KPIs, the role of each member of the surgical team, and the importance of monitoring and evaluation within the hospital.

Some challenges were recognized with this intervention. There were inconsistencies with reporting periods that created discrepancy in the data. Some of the KPI definitions limit the ability to capture the data desired

(such as SSI or POMR). Yet, as an iterative process, the current successes can be built upon to improve what has already shown to be a feasible way to collect standardized surgical data. The following considerations and approach can lead to successful implementation of this intervention nationally.

Recommended Implementation Approach

Following this pilot, the FMOH will have the tools necessary to enact this intervention for standardized surgical data collection nationwide. The national surgical KPIs should be reviewed by an expert meeting convened by the ministry and the recommended registries should be cross-checked for use and printing.

To implement the intervention per the 'Description of Activities', considerations for scaling need to be addressed. Vital to the success of this program is the interactions and collaborations of all stakeholders from the ministry down to the surgical team members. This pilot shows that multiple hospitals can be trained at once on these systems with regional meetings. This system should be leveraged, utilizing the reach of the Regional Health Bureaus to maximize the number of individuals trained. Larger hospitals with more resources can act as leads to train the surrounding general and primary hospitals. Further attention to providing continual support at the primary level will ensure that the new system can be successful. These checks should be done at least quarterly to determine if hospitals need help implementing the registry system.

Figure 8: Recommended SaLTS Leadership Structure stratified by national, regional, and facility levels

VII. IMPLEMENTATION STRUCTURE

In order for SaLTS interventions to be effectively implemented, a strong leadership team and commitment must be established at the national, regional, and facility levels. The recommended framework aligns with the organizational structure previously established under SaLTS Pillar 1: Leadership, Management, and Governance, and is illustrated in Figure 2.
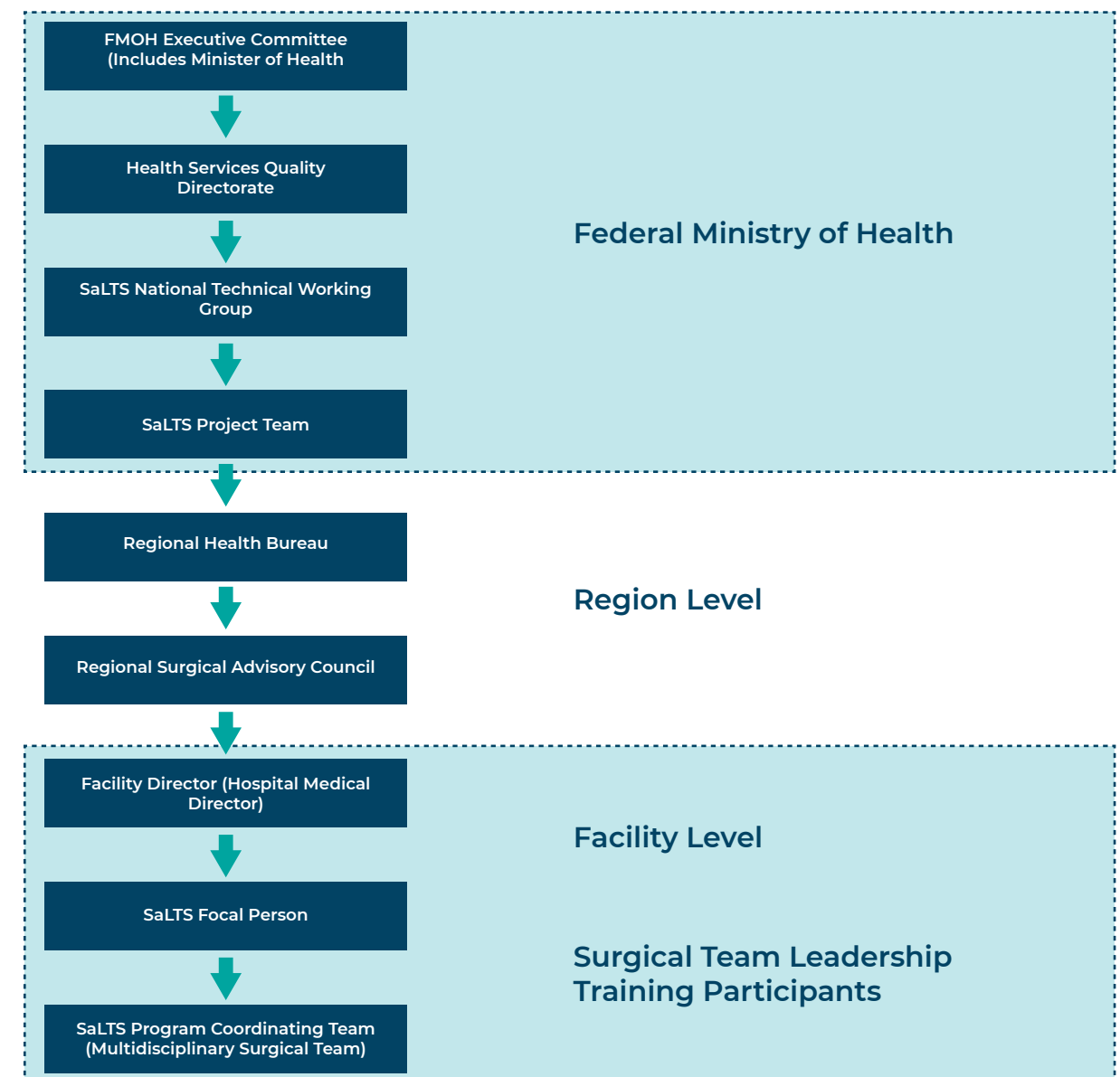
National level

Clear accountability for SaLTS implementation is essential at the federal level. An executive committee within the Health Services Quality Directorate of the Federal Ministry of Health (FMOH) should be responsible for final decision-making. Consensus should be initially obtained within the SaLTS technical working group (TWG) overseen by the FMOH and constituted of a diverse group of stakeholders, including: the Surgical Society of Ethiopia, the Ethiopian Society of Gynecologists and Obstetricians, the Ethiopian Society of Anesthesiologists, the Ethiopian Association of Anesthetists, and other organizations crucial to SaLTS strategizing and implementation.

Inclusion of stakeholders and funding partners ensures increased capacity to implement SaLTS activities beyond the FMOH alone. FMOH personnel within the SaLTS TWG should represent the SaLTS Project Team, communicate directly with the FMOH Executive Committee, and manage daily responsibilities of the SaLTS Initiative. The SaLTS Project Team should designate one person so serve as a focal point for all external communication in order to align stakeholder and partner efforts with FMOH goals.

Regional level

A Regional Surgical Advisory Council within each Regional Health Bureau (RHB) should oversee SaLTS implementation at the regional level and report to the SaLTS focal person at the federal level. The Regional Surgical Advisory Council should designate a SaLTS champion to streamline federal and facility-level communication.

Facility level

A multidisciplinary SaLTS Project team should be established within each facility, overseen by the Hospital CEO or medical director, and constituted of a surgeon or IESO, anesthetist, OR nurse, liaison officer, KPI/HMIS focal person, as well as finance, pharmacy, and cleaning personnel. The aim of the SaLTS Project team is to unite all persons involved in providing quality surgical care at the facility level toward a common goal. The team should meet regularly to review any issues affecting provision of quality surgical care at their facility and assess progress toward their remediation and SaLTS implementation activities. The hospital SaLTS Project team should designate a focal person to be responsible for escalating issues to hospital leadership and ensure their involvement.

LIST OF ANNEXES

Number	Description
ANNEX 1	SaLTS pillars overview
ANNEX 2	Ethiopia SaLTS Tool
ANNEX 3	Ethiopia SaLTS Tool Implementation Training Manual
ANNEX 4	Mentorship monitoring tool
ANNEX 5	Mentorship logbook
ANNEX 6	SPECT Sterile Processing Course Curriculum
ANNEX 7	SPECT Sterile Processing Training Material
ANNEX 8	SPECT Hospital assessment tool
ANNEX 9	WFSA SAFE OB Training Material
ANNEX 10	Essential anesthesia kits
ANNEX 11	FAF Information and Application Guide
ANNEX 12	Facilitator's Guide for OR Equipment Maintenance Skills Course
ANNEX 13	BMET work order tracker tool
ANNEX 14	Piloted Hospital Clinical Registers
ANNEX 15	Package of KPI Training Materials
ANNEX 16	KPI Data Quality Checks
ANNEX 17	Package of KPI Reporting Materials

REFERENCES

[1] Burssa, Daniel, Atlibachew Teshome, Katherine Iverson, Olivia Ahearn, Tigistu Ashengo, David Barash, Erin Barringer, et al. "Safe Surgery for All: Early Lessons from Implementing a National Government-Driven Surgical Plan in Ethiopia." World Journal of Surgery 41, no. 12 (December 2017): 3038–45. https://doi.org/10.1007/s00268-017-4271-5

[2] The Federal Democratic Republic of Ethiopia Ministry of Health (2016) [Internet]. [Addis Ababa, Ethiopia]. Saving Lives Through Safe Surgery (SaLTS) Strategic Plan 2016–2020 https://docs.wixstatic.com/ugd/d9a674_229834ef81bd47ee9cd72f94be1739fe.pdf

[3] Debas, H.T., Gosselin, R., McCord, C., et al. (2006) Surgery. In: Jamison, D.T., Breman, J.G., Measham, A.R., et al., Eds., Disease Control Priorities in Developing Countries, 2nd Edition, Oxford University Press, New York, 1245 -1260.

[4] Burssa, Daniel & Teshome, Atlibachew & Iverson, Katherine & Ahearn, Olivia & Adamu, Tigistu & Barash, David & Barringer, Erin & Citron, Isabelle & Garringer, Kaya & McKitrick, Victoria & Meara, John & Mengistu, Abraham & Mukhopadhyay, Swagoto & Reynolds, Cheri & Shrime, Mark & Varghese, Asha & Esseye, Samson & Bekele, Abebe. (2017). Safe Surgery for All: Early Lessons from Implementing a National Government-Driven Surgical Plan in Ethiopia. World Journal of Surgery. 41. 10.1007/s00268-017-4271-5.

[5] World Health Organization Integrated Management for Emergency & Essential Surgical Care (IMEESC) toolkit. Tool for Situational Analysis to Assess Emergency and Essential Surgical Care. [Internet]. Geneva: World Health Organization; 2018 [cited 2018 February 25]. Available from: www.who.int/surgery/publications/s15986e.pdf

[6] Program in Global Surgery and Social Change [Internet]. Boston: Harvard Program in Global Surgery and Social Change; c2017 [cited 2018 January 7]. WHO-PGSSC Surgical Assessment Tool. Available from: http://media.wix.com/ugd/346076_b9d8e8796eb945fe9bac7e7e35c512b1.pdf.

[7] Program in Global Surgery and Social Change [Internet]. Boston: Harvard Program in Global Surgery and Social Change; c2017 [cited 2018 7 January]. Tool for Situational Analysis to Assess Emergency and Essential Surgical Care in Ethiopia. Available from: https://docs.wixstatic.com/ugd/d9a674_e9481999bec443b5a291199ff33890a4.pdf

[8] Meara JG, Greenberg SL. The Lancet Commission on Global Surgery Global surgery 2030: evidence and solutions for achieving health, welfare and economic development. Surgery. 2015 May 1;157(5):834-5.

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