NATIONAL SURGICAL, OBSTETRICS, AND ANESTHESIA PLAN 2018-2024

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FOREWORD

The development of the National Surgical, Obstetrics and Anesthesia Plan is an unprecedent milestone on the country path towards the Universal Health Coverage. In the last two decades, the Government of Rwanda through the Ministry of Health with the support of its development partners has made remarkable progress in mobilizing efforts overcome the most pressing public health needs including but not limited to the maternal and infant mortality and communicable diseases.

Basing on the 2015 Lancet Commission Report on Global Surgery, Rwanda came forward and together with 8 other countries, proposed the 2015 World Health Assembly resolution 68.15 on Strengthening Emergency and Essential Surgical care and Anesthesia as a component of Universal Health Care Coverage.

Today, with a life expectancy of more than 66 years and the surge of non-communicable diseases and especially the disabilities caused by inappropriate trauma handling, the Ministry of Health decided to broaden its scope of priorities towards the inclusion of access to timely, safe, and affordable surgical care for all Rwandans in its strategic framework. In addition to this, access to safe surgery and anesthesia has been highlighted among the key priorities in our Sector Strategic Plan IV (HSSPIV).

The Ministry of Health in partnership with other health stakeholders and especially the health professional societies such as the Rwanda Surgical Society, Rwanda Society of Anesthesiologists, Rwanda Society of Obstetricians and Gynecologists and the Harvard Medical School Program in Global Surgery and Social Change (PGSSC), the surgical needs were assessed and subsequent consensus workshops highlighted the priorities, strategies were drawn and a Rwanda National Surgical, Anesthesia and Obstetrics Plan (NSOAP) was developed.

The NSOAP highlights where we are today and where we shall be in 2024. It reflects very concrete targets, detailed implementation plan with clear strategic indicators that shall allow a permanent monitoring of progress made. The smooth implementation of this plan calls upon all the stakeholders including the providers, the partners, the insurers, the local administration as well the population at large to ensure ownership and relevant support.

I wish to convey my appreciation to all that have played an active part in the development of the plan and in turn pledges the full support of the Ministry of Health to ensure its full implementation.

Dr. Diane GASHUMBA
Minister of Health

MINISTERE DE LA SANTE

Acronyms and abbreviations

C/S: Caesarean section
CHUB: Centre Hospitalier Universitaire de Butare
CHUK: Centre Hospitalier Universitaire De Kigali
CBHI: Community-Based Health Insurance
COSESCA: College of Surgeons of East, Central, and Southern Africa
CPD: Continuing Professional Development
DH: District Hospital
DP: Development Partners
ECSACOGS: East, Central, and Southern African Association of Obstetrical and Gynecological Societies
EMONC: Emergency Obstetric and Neonatal Care
ENT: Otolaryngologists
GA: General Anesthesia
GS: General Surgery
HF: Health Facilities
HMIS: Health Management Information System
HRTT: Health Resource Tracking Tool
HSSP IV: Health Sector Strategic Plan IV
ICU: Intensive Care Unit
LCOGS: Lancet Commission on Global Surgery
M&M: Morbidity and Mortality
MINALOC: Ministry of Local Government
MoH: Ministry of Health
NPAP: Non- Physician Anesthesia Provider
NSC: National Steering Committee
NSG: Neurosurgery
NSOAP: National Surgical Obstetric and Anesthesia Plan
NST1: National strategy for Transformation 1
OBGYN: Obstetrics and Gynecology
OT: Operating Theatre
PGSSC/HMS: Program in Global Surgery and Social Change/Harvard Medical School
PH: Provincial Hospital
QI: Quality Improvement
RBC: Rwanda Biomedical Centre
REST: Rwanda Essential Surgical Training
RRH: Regional Referral Hospital
RMDC: Rwandan Medical and Dental Council
RMH: Rwanda Military Hospital
ROS: Rwanda Ophthalmologists Society
RSA: Rwanda Society of Anaesthesiologists
RSOG: Rwanda Society of Obstetrics and Gynaecologists
RSS Rwandan Surgical Society

RSSB: Rwanda Social Security Board
SAO: Surgeon, Anesthesiologist, Obstetric-Gynecologists
SAO: Surgical, anaesthesia and Obstetrics-Gynaecology
SDGs: Sustainable Development Goals
TWG: Technical Working Group
UHC: Universal Health Coverage
UMCS: Urine microscopy, culture, and sensitivity
UR/CMHS: University of Rwanda/ College of Medicine and Health sciences
WFSA: World Federation of Societies of Anesthesiologists
WHA: World Health Assembly
WHO: World Health Organization

1. Executive Summary

As the global health community has embraced universal health coverage, there has been an appropriate recognition of the need to include surgery, obstetrics, and anesthesia care. In 2015, the Lancet Commission on Global Surgery described the surgical landscape in low and middle-income countries and called for the development of National Surgical, Obstetric, and Anesthesia Plans (NSOAPs) in order to strength surgical care worldwide. With the support and encouragement of multilateral organizations, NSOAPs are paving a way forward for the provision of high-quality, safe, and affordable care for all. That same year, at the World Health Assembly, Resolution 68.15 was passed mandating the inclusion of emergency and essential surgical care into Universal Health Coverage.

Rwanda was one of the key informants and supporters of this movement and since then has committed to the development of a NSOAP to improve surgical care in Rwanda for all Rwandans. Over the past year, because of the commitment, passion, and dedication of a wide range of stakeholders including the Ministry of Health, surgeons, obstetricians, nurses, anesthetists, bioengineers, and residents, Rwanda has completed an NSOAP. The development of this document was led by the Ministry of Health in collaboration with other stakeholders namely the development partners, professional societies (surgical, anesthesia, and OBGYN), private practitioners and civil society organizations. The NSOAP is organized into the six major domains of a health system: infrastructure, service delivery, workforce, information management, finance, and governance. The output from this plan will not only improve surgical, obstetric, and anesthesia care but will also build on the improvement of the Rwandan health system as a whole.

Rwanda is the first country to date to complete a full baseline assessment of all district hospitals in order to more accurately inform the priorities of the NSOAP. A baseline assessment was carried out in April 2017 by surgical residents who surveyed all district hospitals over a 3-week period. The details of the report exist throughout this NSOAP providing the background information for each of the major domains. In brief, the greatest gap and hindrance to adequate surgical, anesthesia, and obstetric care was identified to be in workforce and training. Therefore, priority for the plan is expanding the workforce not only at the specialist level but also for the non specialist and non-physician providers and ancillary staff.

Below are the key priorities for each of the six domains. Following this executive summary is a detailed plan in how each of the activities and priorities will be implemented, monitored, and evaluated, and a projected cost for each. If fully implemented, at least 8 regional referral hospitals will be able to take care of most of the surgical needs in the country, leaving complex surgeries to national referral hospitals; all district hospitals will be able to perform the Bellwether procedures, in addition to a list of essential surgical procedures decided upon by the stakeholders. Every hospital will have the infrastructure to sustain full-time operating theatres with the proper equipment. Patients will be able to seek care and be referred in a timely

manner. Patients will be able to undergo a surgical procedure without fear of impoverishment. Rwanda will be able to provide safe, affordable, high-quality surgical care to all Rwandans.

Infrastructure

Infrastructure is a key priority for strengthening Rwanda's surgical system. Sufficient facilities, equipment, and supplies are essential to the delivery of safe surgical, obstetric, and anesthesia services. The baseline data revealed an adequate geographic distribution of hospitals (almost 100% of the population has 2-hour access to a facility that should be capable of performing the Bellwether procedures), however a significant number of the operating theatres (23%) were non functional.

One of the key priorities for this plan is the rehabilitation of all operating theatres to ensure that each operating theatre is able to function twenty-four hours a day to treat surgical patients. This will include ensuring proper lighting, electricity, water, sterilization, operating tables, and operating equipment. This will also include ensuring adequate anesthesia equipment that is needed to support an operation and any perioperative care. The plan details the expansion of pharmacy, laboratory, blood system, and radiology services as well as improvement of the supply chain to ensure timely distribution of critical supplies.

Service Delivery

Increasing service delivery is necessary for increasing access to surgical services. The surgical volume per population in 2017 was 786 procedures per 100,000 population at the district and provincial hospital level, compared to the LCOGs recommended 5,000 procedures per 100,000 population. Out of the 42 district hospitals, only 10 hospitals could provide all 3 Bellwether procedures (laparotomy, cesarean section, and open fracture reduction).

To ensure all district hospitals are Bellwether-capable, the priority will be training of providers on the Bellwether procedures. Further, it will include prioritizing the distribution of providers so that each hospital will have the capability to perform all surgeries on an essential surgical list (table) that was decided upon by stakeholders. Each district and provincial hospital will have one surgeon, one obstetrician, and one anesthesiologist.

Distribution of nurses, anesthesia techs, and ancillary staff is further detailed in the plan. In addition, there is a major emphasis on improving the quality of care through different initiatives including monitoring of consent documentation, use of the WHO Safe Surgery checklist, and standardizing postoperative documentation, to name a few.

Anesthesia	Basic	Emergency	General	OBGYN	Ortho	Specialty	Urologic
General anesthesia	Biopsies	Burn Management	Appendectomy	Caesarean delivery	Amputation	cataract	Cystostomy
Ketamine sedation	I&D	Chest tube insertion	Contracture release/ grafting	D&C	Closed fracture	cleft lip	Urethral stricture dilation
Regional blocks	Circumcision	Cricothyroidotomy/ Tracheostomy	Hernia repair	Obstetric fistula repair	Clubfoot repair	neonatal/ pediatric surgery	Scrotal emergencies
Spinal	Removal foreign body	Resuscitation	Hydrocele	tubal ligation/vasectomy	Drainage of osteomyelitis	epistaxis	Paraphymosis
	Suturing	Central line placement	Laparotomy	Laparotomy	Joint dislocation	dental extraction	
	Wound debridement		Perianal abscess	Cerclage	open fracture repair	dental filling	
			anal fistula or fissure	Cauterization of condyloma			
				I & D Bartholin			
				Marsupialization			
				Hematocolpos			

Table 1. Essential surgical procedure list

Workforce

The surgical workforce (surgeons, anaesthetists, obstetricians, nurses, etc.) has been identified as the largest barrier to providing essential surgical services in Rwanda. In 2017, there were a total of 119 SAO providers (62 surgeons, 18 anesthelogists, 39 OBGYN) which translates to a density of 1.006 providers per 100,000 population. LCOGs recommends a minimum of 20 providers per 100,0000 population. At the district level, there are a total of 25 SAO providers for 42 hospitals (9 surgeons, 2 anesthesiologists, and 14 obstetricians). At the referral hospital level, there are 94 SAO providers.

The most important initiative within the NSOAP is the expansion of training for SAO providers. More specifically, Rwanda plans to expand the graduating class of anesthesiologists by 5 additional residents, general surgery by an additional 19 residents, and OBGYN by 18 residents, as well as increase the number of ENT, ophthalmology, urology, neurosurgery, orthopedic, and maxillofacial surgeons. In addition to training more surgeons, the other key priority will be training non-surgeon clinicians to be proficient in performing Bellwether procedures. This will include increasing the number of non-surgeon clinicians a year to 100, and also expanding the current REST course.

To ensure proper distribution of these providers, multiple retention strategies are highlighed including financial incentives for serving in district hospitals, additional services for families (housing, internet, education, etc), as well as an attractive package for graduating residents to practice in rural settings directly out of training. Another priority will be increasing the recruitment of medical students and undergraduates into SAO specialties.

Information Management

A surgical system is incomplete without attention to information management and research capacity-building. Information management includes developing systems for accurate data collection around diseases and outcomes. This information can be used to inform policy and quality improvement at the facility and national levels with evidence-based decision-making. Currently, although most hospitals do employ personnel for records maintenance, there is inconsistency in record keeping, data collection, and record maintenance between facilities.

The major priority for information management will be to establish the regular data collection of at least the 6 LCoGS indicators. In addition, the stakeholders have agreed upon a longer set of indicators for the entire plan that will be integrated into the HMIS system to inform decision-making and policy-making going forward. Besides indicators, this will also include a registry of SAO providers, nurses, and ancillary staff to monitor distribution, attrition, and retention. Another major priority will be developing a network of research units at specified hospitals and a system for prioritizing clinical investigations to improve quality of care. Developing capacities in research will also be a priority by providing incentives for research mentorship and leadership.

Finance

MoH is guided by several principles in the development and implementation of the Health Financing and Sustainability Policy: equity, risk-sharing, solidarity, efficiency, evidence-based decision making, and results-based financing and management. There is also a call for transparency and accountability; and ownership, empowerment, participation, and partnerships. The CBHI database showed 85% CBHI coverage in 2011, while the formal sector schemes and private insurance account for 6% of the population, bringing the total health insurance coverage to 91%.

Although coverage is very high, the major priority will be decreasing the out-of-pocket costs for patients who receive surgical care. It will reinforce established surgical index pricing for out-of-pocket costs for patients at each CBHI level. A commitment to frequent auditing of the out-of-pocket costs to improve the impoverishing and catastrophic rates of surgical care will be done every three years. Another priority will be increasing the overall budget of the MoH funding of surgical, anesthesia, and obstetric care at the district hospital level. There will also be a new emphasis on partnerships with external organizations in order to help support NSOAP implementation and improve care.

Governance

Proper governance is essential to the implementation of policies for advancing Rwanda's surgical system. This will begin with proper dissemination of the plan to the health facilities. Hospitals will have presentations to all staff on the priorities of the NSOAP and what initiatives will be implemented at their hospital. To ensure coordination of efforts, an NSOAP coordinator will be nominated, below who will be multiple NSOAP committees for each province, as well as designated NSOAP sub-coordinators for each of the six domains of the plan. Each hospital will have a designated staff member to oversee the NSOAP efforts at their own hospital. This will ensure accountability, progress, and local/decentralized leadership. Quarterly reports will be produced by each domain coordinator, with review of these reports twice yearly by the original steering committee of NSOAP. There will be significant involvement and dedication by all of the societies (surgery, anesthesia, and OBGYN) to direct implementation of the NSOAP.

Costing

Once all activities were agreed upon, a cost was calculated for each activity. This effort was led and carried out by the Ministry of Health. A summary of the costs is found below. The total cost of the NSOAP is about ~$70 million USD over the next 6 years. The NSOAP costing accounted for both fixed and variable costs attributed to each of the domains during the given years. Given that many of the activities are cross-cutting, Rwanda should see improvement and strengthening of the health system as a whole through implementing this plan.

Table 2. Costing Summary

Domain	Implementation Cost per Fiscal Year						Cost per domain (USD)	
	FY 2018/19	FY 2019/20	FY 2020/21	FY 2021/22	FY 2022/23	FY 2023/24		
Infrastructure	5,468,322.62	5,468,104.47	3,367,258.75	3,449,606.92	3,704,671.20	1,789,485.97	23,247,449.93	**33.34%**
Service Delivery	1,565,980.00	2,531,096.00	3,494,614.00	4,494,472.00	5,311,520.00	5,009,312.00	22,406,994.00	**32.13%**
Work Force	1,609,350.00	2,519,380.00	3,436,874.00	4,223,114.00	5,146,386.00	5,100,036.00	22,035,140.00	**31.60%**
Information Management and Technology	272,697.70	281,707.70	281,707.70	281,707.70	281,707.70	281,707.70	1,681,236.20	**2.41%**
Governance	46,935.00	43,885.00	43,885.00	43,885.00	43,885.00	43,885.00	266,360.00	**0.38%**
Finance	17,182.00	18,752.40	8,841.00	18,752.40	17,182.00	17,182.00	97,891.80	**0.14%**
Total	**8,980,467.32**	**10,862,925.57**	**10,633,180.45**	**12,511,538.02**	**14,505,351.90**	**12,241,608.67**	**69,735,071.93**	

2. Background and Context

2.1. Background to National Surgical, Obstetric, and Anaesthesia Plans

Global Context

In 2013, *The Lancet* Medical Journal initiated a process to convene experts in surgery and anaesthesia, researchers, economists, and policymakers to address the state of surgery worldwide and to provide concrete recommendations for its improvement. The Lancet Commission on Global Surgery (LCoGS) culminated in the release of a seminal report in 2015 titled *Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development*.[1]

This report included startling findings: 5 billion people in the world do not have access to safe, affordable, and timely surgical and anaesthesia care. Over 143 million additional procedures are needed worldwide to meet the gap between available and necessary procedures. At least a quarter of patients who do receive surgery are financially impoverished as a result. Economic losses from the burden of surgical illness will amount to almost 2% of the GDP of low and middle-income economies by 2030.[2] Additionally, LCoGS recommended a framework for countries to support scale-up of surgical access and services in a coordinated and effective manner. The National Surgical, Obstetric and Anaesthesia Plan framework presented concrete recommendations in the six essential domains of an effective and resilient surgical system: (1) infrastructure, (2) workforce, (3) service delivery, (4) information management, (5) financing and (6) governance. Finally, to ensure mutual accountability and continuous improvement, LCoGS also recommended six, easy-to-collect but powerful indicators to measure and track access and quality of surgical care:

1. **Access to timely essential surgery (two-hour access):** The proportion of the population in each country that can reach, within two hours, a health facility capable of providing caesarean section, laparotomy, and treatment of open fracture (the Bellwether procedures).
2. **Surgical, anaesthesia and Obstetrics-Gynaecology (SAO) provider density:** The number of specialist surgical, anaesthetic, and obstetric (SAO) providers per 100,000 population.
3. **Surgical Volume**: The number of procedures undertaken in an operating theatre per 100,000 population per year. A procedure is defined as the incision, excision, or manipulation of tissue that needs regional or general anaesthesia, or profound sedation to control pain.
4. **Perioperative Mortality Rate (POMR):** The number of in-hospital deaths from any cause in patients who have undergone a procedure done in an operating theatre, divided by the total number of procedures, presented as a percentage.
5. **Risk of impoverishing expenditure for surgical care:** The probability of experiencing impoverishment when surgical care is required.
6. **Risk of catastrophic expenditure for surgical care**: The probability of experiencing catastrophic expenditure when surgical care is required.

For each of these indicators, a target was recommended by LCoGS:

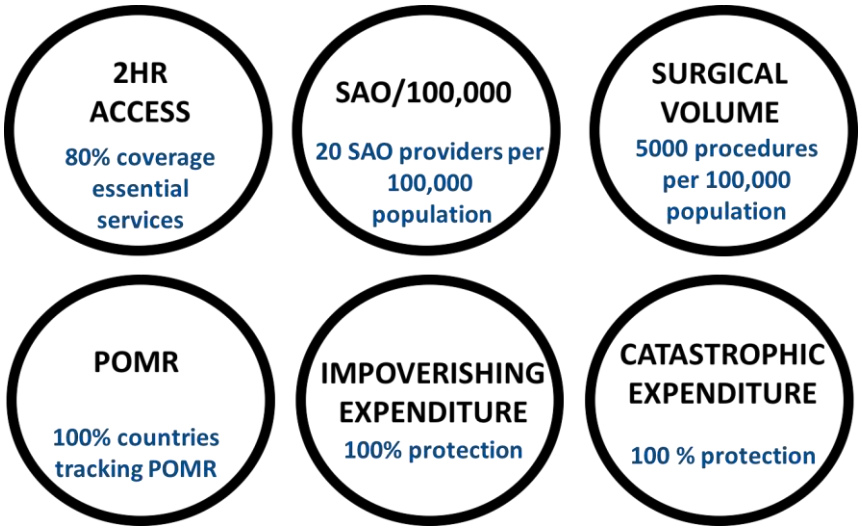


Figure 1. Lancet Commission Indicators and Targets

In May 2015, at the World Health Assembly, Resolution 68.15,[3] which called for the prioritization of and inclusion of emergency and essential surgical care and anaesthesia as part of Universal Health Coverage was unanimously passed by all 194 member states (including Rwanda). This led to a new wave of NSOAPs mainly across Sub-Saharan Africa to push for inclusion of surgery, anaesthesia, and obstetrics into national health plans.

Rwanda Context

An estimated 58.7% of Rwandans do not have access to timely, safe, and affordable surgical and anaesthesia care.[4] Whereas surgery has traditionally been a neglected part of healthcare in resource-constrained settings, recent research and evidence demonstrate that surgery must become a priority in strengthening health systems. Surgery is now understood to be cost-effective, affordable, economically beneficial, and essential for high-quality patient care. Given this, Rwanda is advocating for a nation-wide effort to improve surgical access and surgical care.

2.2. Linkages to the health policy and other sector development agendas

The Rwanda health sector has made remarkable strides in the past few decades. The current NSOAP was written to align with the Health Sector Strategic Plan IV (HSSP IV), Vision 2050, the Health Sector Policy 2015, NST1, Universal Health Coverage (UHC) principles and the Sustainable Development Goals (SDGs) which lays out a target for Rwanda to become high-income country with better quality of life of the population by 2050. A diagram of the structure of Rwanda Health system is found in the **annex** as well as the location of all hospitals.

The National Surgical, Obstetric and Anaesthesia Plan (NSOAP) has been identified as a key component in reaching the vision for the Rwandan health sector, as well as achieving the Vision 2050. This strategic plan lays out a roadmap to significantly improve access and quality of surgical care for all Rwandans, which will create significant socio-economic benefits for the country.

2.3. Process for NSOAP development

The MoH in collaboration with other stakeholders (MoH, RBC, MINALOC, RSSB, Professional Societies, Nursing and Midwife Association, University Teaching Hospitals, Private Medical Practitioners Association, University of Rwanda/College of Medicine and Health Sciences, Referral Hospitals, the Program in Global Surgery and Social Change from Harvard Medical School and other Development Partners) has embarked to develop Rwanda's first National Surgical, Obstetric, and Anaesthesia Plan (NSOAP). The aim of the NSOAP is to increase access to timely, safe, affordable surgery and anaesthesia for all Rwandans.

The development of NSOAP was done through the following process:

An initial meeting was held between MoH leadership and the concerned professional societies to agree on the strategies to adopt for accomplishing the mission. The meeting decided to establish a National Steering Committee with the mandate to assist the Ministry to define priorities in surgical, obstetric and anaesthesia care delivery, oversee and support the development of the NSOAP. The National Steering Committee is composed of MoH, RBC, MINALOC, RSSB, Professional Societies (RSS, RSOG, RSA), Nursing and Midwife Association, University Teaching Hospitals, Academic Institutions and Private Medical Practitioners Association.

2.3.1. Establishment of the National Steering Committee (NSC)

The NSC organised a retreat and all NSC members participated in the retreat of the NSC, where the strategic guidance, details about the process and content of the plan were shared. Then the NSC appointed a small technical team to collect information on baseline data on surgery and further to develop the NSOAP.

2.3.2. Field visit and Key Informant Interviews (KIIs)

A nationwide hospital assessment utilizing the World Health Organization-Program in Global Surgery and Social Change Surgical Assessment Tool and Qualitative Interview tool was performed to assess the current surgical capacity in Rwanda.[5] The assessments were completed in March 2017 over a 3-week period. Surgical Residents in the UR/CMHS along with members of the PGSSC performed the assessments. The collected data was analyzed using descriptive statistics with STATA 12 and a report created. The team undertook KIIs in all the district,

provincial and regional referral hospitals in the country to get qualitative information on surgical and anaesthesia care. At National level, KIIs were held with the MoH Leadership and Senior Managers in the Health Sector.

2.3.3. Desk Review and draft NSOAP Writing

The technical team conducted analytic desk reviews to examine national and international literature that informed the NSOAP formulation process. MoH and other NSC members availed relevant and updated information to the team. Some of the key documents reviewed included the Rwanda Vision 2015, Rwanda Vision 2020, NST1, Health Sector Policy 2015, HSSP IV, and the HSSP III Mid Term Review Report, MoH Annual Reports, and other sources of information. Once the decision was made to develop a NSOAP, the MoH along with other stakeholders listed above met to develop an overall strategy for moving forward. The first step was identifying the major gaps in surgical care. To do this, the information gathered from the field visit as well as the previously mentioned documents were reviewed.

Next, two meetings were held. A two-day NSC writing workshop in Nyamata-Bugesera District where the results of the baseline assessment were disseminated and discussed. From the NSC workshop, the draft NSOAP plan was written and presented in one-day meeting of the Planning, Health Financing Technical Working Group (TWG) in order to collect inputs and ideas from the participating stakeholders for further improvement. Thereafter, the plan was costed.

2.3.4. Costing process of the NSOAP

The process of developing the itemized costing list was completed with documents provided by the MoH. Each strategy in the NSOAP has been broken down into monetary units required to fulfill the strategy and the targets established by the NSOAP. MoH was again consulted to confirm all pricing based on former experience of costing within the MoH.

3. Situational Analysis

3.1. Current Status of Rwanda Health

In the line of the Universal Health Coverage (UHC) and a global commitment under the Sustainable Development Goals (SDGs) where all people are entitled to quality essential health services, no matter who they are, where they live, or how much money they have, surgical and anaesthesia care is considered as a crucial component of building strong health systems.

Rwanda met most of the Millennium Development goals due to visionary leadership, rapid economic growth and improvements in living standards. Access to services and human development indicators have been improving due to internal policy changes, initiatives and innovations. Despite the investment in health systems and continuous supply of new trainees, there is still a need to meet the surgical burden of disease in Rwanda.

Rwanda recognizes the importance of understanding the baseline surgical landscape of the country prior to writing of a National Plan. Following the LCoGS recommendations, the Six Lancet surgical indicators were defined using mostly data collected from a baseline hospital assessment performed in 2017 at all district hospitals as well as retrospective review of peer-reviewed literature and published reports.

At the district level, the ability to provide surgical care is not uniform across all hospitals and the specific needs at each hospital pertaining to surgical, anaesthesia, and obstetric care is quite variable. Throughout this document, the baseline district hospital assessment data will be presented under each domain.

3.2. Gaps in Surgery, Anaesthesia and Obstetrics in Rwanda (LCoGS Indicators)

Throughout this baseline assessment report, surgical volume and POMR only account for the 42 district hospitals, and do not include the tertiary or teaching hospitals. SAO density was calculated from the RMDC records and includes certified providers registered in the database at all facility levels, including tertiary and teaching hospitals.

3.2.1. Two-hour Access

The first indicator, two-hour access to safe surgery was previously reported to be 41.3%.[4] In our baseline assessment, the geographical access to a hospital able to perform surgery is within 2-hours **for 100% of the population**. This number was calculated using driving distance, following the speed limit to a facility that provides surgical care. This number does suggest an appropriate placement of surgical facilities to ensure access to the entire population.

A major goal of this plan will be to improve the infrastructure, supply, equipment, and staffing, of these well-placed facilities to ensure their ability to provide high-quality surgical care.

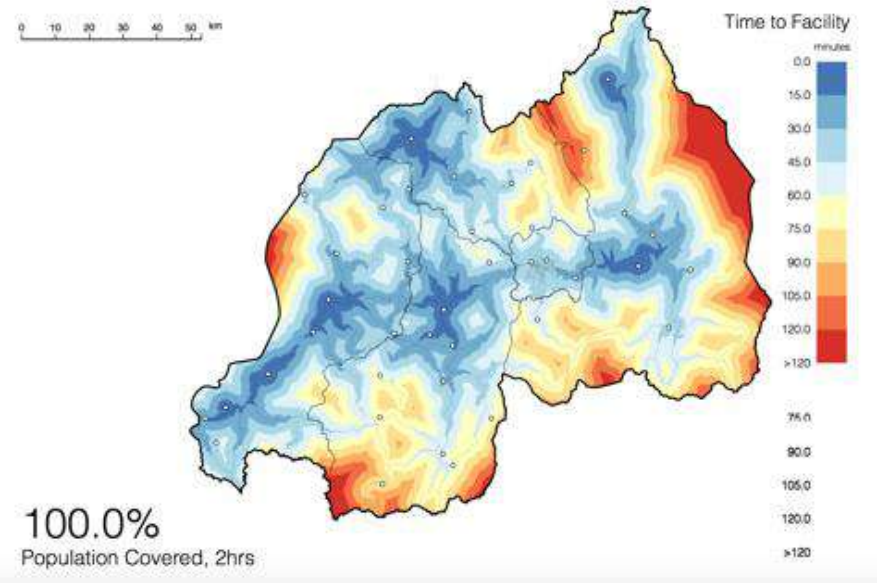


Figure 2. Two-hour access for Rwanda[1]

3.2.2. Surgical Volume

The average total surgical cases per year at the 42 districts hospitals is 1,703 cases/hospital. Between 2016-2017 a total of 71,518 procedures were performed across the 42 district hospitals, and 21,374 procedures were performed at the tertiary hospitals CHUK, CHUB, and RMH, for a total of 92,892 procedures for a catchment of 11,823,248 people. The surgical volume per population is calculated to be **786 procedures per 100,000 population** (at both secondary and tertiary levels however these figures do not include procedures carried out in private facilities). This is compared to the 5,000 procedures per 100,000 population recommended by the LCoGS.

The goal therefore will be to increase the number of surgical procedures performed (at secondary level) first at strategically selected hospitals with a plan for scale up to other hospitals to eventually meet the LCOGS recommendations.

3.2.3. SAO Provider Density

There is a total of 25 surgical, anaesthetic, and obstetric (SAO) providers at the 42 district hospitals. These are 9 surgeons, 2 anaesthesiologists, and 14 obstetricians across all district hospitals. There are 20 Surgeons, 5 Anaesthesiologists, and 9 Obstetricians at CHUK; 16 surgeons, 4 anaesthesiologists, and 6 obstetricians at RMH; and 8 surgeons, 5 anaesthesiologists, and 5 obstetricians at CHUB, 9 surgeons, 2 anaesthesiologists and 5 obstetricians at KFH for a total of 53 surgeons, 16 anaesthesiologists, and 23 obstetricians at the teaching hospitals. For all district hospitals, provincial hospitals and the 4 referral hospitals, there is a total of 119 SAO providers (62 surgeons, 18 anaesthesiologists, 39 obstetricians). **The**

[1] Courtesy of Redivis

total SAO density is 1.006 per 100,000 population. This SAO provider density is well below the target of 20-40 SAO providers per 100,000 population recommended by the LCoGS. These figures do not include SAO providers from private health facilities

To address this gap, this plan includes ways to expand recruitment, training, mentorship, and retention to increase the number of SAO providers in Rwanda.

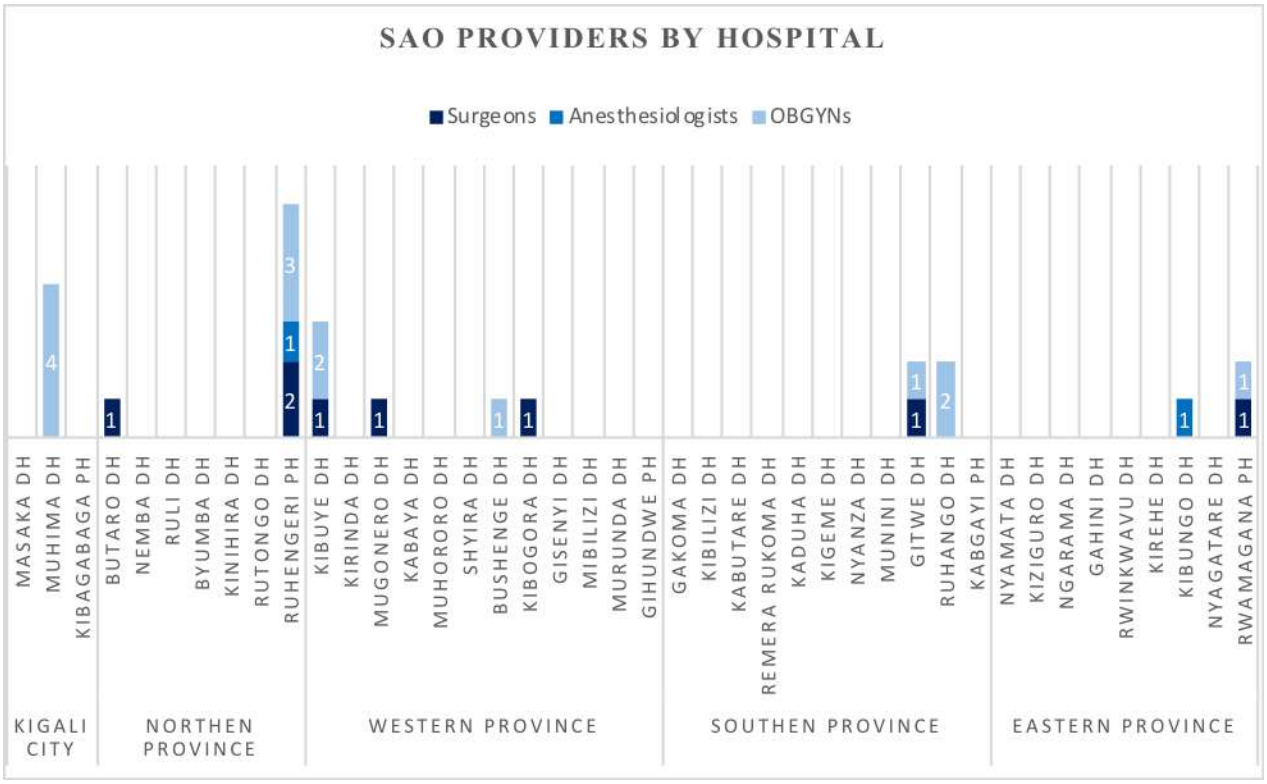


Figure 3. SAO providers per hospital

3.2.4. Perioperative Mortality Rate (POMR) Tracking

POMR was reported by 32 of the 42 district hospitals, with an average of 7 in-hospital deaths related to surgery per year and an average perioperative mortality rate of 3.11 per 100,000 population. **Tracking of POMR is 76.2% compared to the LCoGS recommendation of 100%.** Data collectors reported variability in the reporting of POMR at district hospitals as a challenge of quality data collection. Perioperative mortality represents the most basic measurement of surgical and anaesthesia outcomes. In Rwanda, the perioperative mortality rate is highly variable, with a maximum perioperative mortality rate of 30%. This is likely a result of inaccurate reporting systems as well as a lack of adequate procedures performed. Previous reports have suggested a POMR of 6%.[6]

To improve the POMR and accurate reporting in Rwanda, the plan outlines initiatives for better tracking of POMR as well as improvement in quality and quantity of surgical care provided.

3.2.5. Impoverishing and Catastrophic Expenditure

Financial protection and impoverishment expenditure were computed considering both Out of Pocket collected from financial data from District Hospital and household income or expenditure using information from EICV 4. Hence, the standard methodology to estimate financial protection from household was not followed.

In this document, household expenditure on surgery related cases was based on data collection at the district hospitals, while the household income was estimated using data from EICV 4. EICV4 collects information from a sample size of 14,419 households well distributed across the country where data from household income are computed using income expenditure to overcome some related limitation that reported income information from household to estimate the extent to which household that sought surgery related service may encouter financial catastrophic of 10% of household expenditure. This suggests that a household that spent more than 10% of its income on health care services is at risk of experiencing catastrophic expenditure. While for the impoverishment effect of OOP due to OOP is defined as any household which slide beyond poverty or which were even pushed further in to poverty as result of OOP when seeking healthcare. As information used were collected from health facilities rather than household survey, to generalize these the study findings to the whole population, a couple of assumption need to be factored in:

1. As of FY 2016-2017, the Health Insurance membership coverage in Rwanda were more than 90%.
2. All Surgeries cases and medication related costs have been considered
3. The average household income in Rwanda is 308,999 Frw
4. The poverty and extreme poverty lines are 159, 375 and 105,064 Frws respectively as reported by EICV 4.

The study findings revealed that 50,3% of individual without health insurance who sought for health care services were at risk of experiencing financial catastrophic as result of seeking surgery care at district hospitals while only 6.6% of those covered with any kind of health insurance were at risk. Therefore, estimating the risk of surgery related catastrophic expenditure, this study reports on average, almost 11% of Rwanda will be at risk facing catastrophic expenditure as shown in the table below

Table 3. Financial Expenditure Incidence at Population level

Estimated Rwanda Population (2016)	Catastrophic Financial Estimated with individual with Health Insurance Coverage (6.62%) (A)	Catastrophic Financial Estimated with individual without Health Insurance Coverage (50.3%)(B)	Total estimation of population who faced Catastrophic Expenditure at Population level (11%) of 12000000

12000000 (100%)			
90% HI Covered (10800000)	714,960		
10% uncovered by any HI (1 200 000)		603,600	1,318,560

Table breakdowns the comparison of catastrophic expenditure by patients covered by health insurances and those who are not. On average, 11% of the total population are likely to face catastrophic expenditure while seeking surgical services at district hospital.

However, with regard to the impoverishment effect of surgical services, the available data could not provide proper analysis as they were collected from health facilities financial information and thus, they could not provide information on each household or patient income to estimate the impoverishment effect of surgery healthcare related payment.

To address this indicator, the plan specifically outlines initiatives to decrease the cost to patients for surgical procedures.

Table 4. Current Financial Burden from Assessment Survey

	Mean	Kigali Province	North Province	West Province	South Province	East Province
Health Financing						
Surgical patients unable to pay hospital bill (mean)	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
Average bill patients unable to pay for (RWF)	421.559	175.000	2.054.167	115.917	110.708	148.000
Out-of-Pocket Costs (RWF)						
C-section cost	10.343	10.800	11.400	9.658	10.800	9.722
Open fracture repair cost	4.621	3.033	7.440	5.913	3.100	4.133
Laparotomy cost	7.967	6.000	12.483	6.552	8.836	6.000
CBC cost	1.585	1.500	1.718	1.500	1.500	1.728
Chest x-ray cost	2.044	1.950	2.143	1.954	1.950	2.233

Whereas surgery has traditionally been a neglected part of health care worldwide, recent research and evidence demonstrate that surgery must become a priority in strengthening health systems. Surgery is now understood to be cost-effective, affordable, economically beneficial, and essential for patient care. While Rwanda has made dramatic improvements in

maternal mortality, under-five mortality, and life expectancy, surgery remains an area for improvement in Rwanda's health system strengthening.

4. Vision, Mission, and Key Strategic Objectives

4.1. Vision and Mission

The vision of this plan is to provide all Rwandans with timely, safe, and affordable surgical, obstetric, and anaesthetic care.

To achieve this vision and mission, we plan to improve surgery under the following domains: infrastructure, service delivery, workforce, information management, financing, and governance.

4.2. Strategic Objectives

The Overall objective of the NSOAP is to ensure access to safe and affordable surgical, obstetric, and anaesthesia care for all Rwandans.

This overall objective will be attained through the following strategic objectives:

a. **Infrastructure**
   - To ensure infrastructure at all DH, PH and RRH meet minimum standards for providing essential surgical services

b. **Service Delivery**
   - To increase access to health care services for all Rwandans with hospitals having capacity to deliver the basic packages of surgical services.

c. **Workforce**
   - To ensure availability of a qualified, competent and motivated workforce to deliver quality surgical services

d. **Information Management**
   - Improve monitoring of surgical indicators and increasing research capabilities in surgery, anaesthesia and obstetrics

e. **Finance**
   - Improve financial protection for patients receiving surgery and increase allocation of funds to surgical care

f. **Governance**
   - Improving coordination of care to ensure implementation of NSOAP

4.3. Comprehensive Strategic Framework

To develop a comprehensive framework for surgical, obstetric, and anaesthesia care, the following 6 domains have been considered: infrastructure, service delivery, workforce, information management, finance and governance. Coordination between all domains must be achieved to truly improve the overall surgical system.

4.4 Infrastructure

Infrastructure is a key priority of strengthening Rwanda's surgical system. Sufficient facilities, equipment, and supplies are essential to the delivery of safe surgical, obstetric, and anesthesia services.

Across the five provinces of Rwanda, public facilities included 35 district hospitals, 4 provincial hospitals, and 3 referral hospitals. There are 91 total operating rooms, and all hospitals have a minimum of 2 ORs, however only 1 OR is functional in 11 hospitals. There are 1533 total surgical beds, and only 2 ICU beds. Across all 42 hospitals, there are 42 nonfunctional and 88 functional autoclaves. While electricity and oxygen are available the majority of the time, 33% of hospitals are not connected to the national water system. Oxygen plants are available in 3 hospitals, and the mean distance to oxygen supply is 112km (range 0-300km). Pharmacy, laboratory, and radiology services are variable. While the majority of hospitals have x-ray and ultrasound available, only one hospital has a functional CT scan, and no hospitals have MRI or C-arm. Laboratories are frequently able to perform basic exams, but lack capacity for processing culture and sensitivity (5/42 hospitals able) and coagulation studies (9/42 able). Blood banks are located at CHUK, CHUB, Ruhengeri, Rwamagana, and Karongi, however all hospitals have some on-site reserve.

While the 2-hour access indicator demonstrates adequate geographic distribution of hospitals, strengthening surgical infrastructure is critical to ensure basic surgical services can be consistently delivered efficiently and safely when surgery is needed.

4.2.1 Improve infrastructure to meet minimum standards

Objective: Improve infrastructure at all district hospitals to meet minimum standards for providing essential services.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Stabilization of existing electricity source	100%	All hospitals connected to the national system	*Not surgery-specific infrastructure*
All hospitals with automatic back-up generator	100%	27 DHs rarely (1-25%) rely on a generator; 6 almost always; 5 always relying on a generator	
All hospitals connected to national water system (Include details of hospitals which are not connected to the National system, provide updates of the current situation from MoH)	100%	28 hospitals connected to national system, 14 not connected	
At least 1 large water tank per hospital (Determine the standards by the MoH)	100%	25 hospitals do not have access to water always	
30 oxygen cylinders and 30 regulators per hospital (add in-hospital oxygen distribution)	100%	811 cylinders, 179 regulators	
New oxygen plants in all provincial and referral	N/A	Oxygen plants	

hospitals (At least one oxygen plant in each province: 5 plants)		(Ruhengeri, Rwinkwavu, Ngarama, KFH, RMH)		
Mural connection to oxygen supply	100%	Unknown		
Rehabilitation of non-functional operating theatres	100% functioning theaters in hospitals	27 non-functional, 91 functional	Rehabilitate 27 non-functional major OR	
Rehabilitate existing functional OR's at all District and Referral Hospitals to meet minimum standards	15 ORs rehabilitated per year	91	91	
Sustained maintenance of all ORs to maintain minimum standards	At least one maintenance per OR per year	0	118	
One operating room dedicated to maternity per hospital	At least 5 hospitals have maternity OR per year	Unknown	Unknown	
Operating theatres meet minimum requirements as defined by the MoH Services Packages	% of standard ORs	Unknown	Unknown	
Adequate number of surgical beds per hospital	Surgical bed occupancy rate in %	Unknown	Unknown	
Non-functional anesthesia machines repaired	Number of non-functional anesthesia machines	36 non-functional anesthesia machines	Maintenance for 36 anesthesia machines	
At least 1 anesthesia machine per functioning operating theatre	Number of anesthesia machines per functioning theatre	70 functional anesthesia machines	21 anesthesia machines	
At least 1 additional back-up anesthesia machine per hospital	Number of hospitals with back-up	0 back-up anesthesia machines	42 anesthesia machines	

	anesthesia machine			
At least minimum required surgical equipment in theatres	Number of theatres meeting minimum equipment standards	Unknown	Unknown	
At least minimum required surgical supplies in surgical wards	Number of properly equipped surgical wards	Unknown	Unknown	
Biomedical engineering strategy by province, with 1 biomedical engineer per hospital	Number of hospitals with one biomedical engineer	3 biomedical engineers	42 biomedical engineers	
Regional and National medical equipment maintenance guidelines (Reference to the MoH document)	100% guidelines available	Unknown	Unknown	
Scheduled preventative and regular maintenance of equipment	Number of hospitals in which scheduled preventive maintenance is carried out	Unknown	Unknown	
1 sterilization unit per hospital	Number of hospitals with sterilization unit	Unknown	22 sterilization units	
1 autoclave per operating theatre, 1 autoclave per surgical ward (Portable)	Number of ORs with autoclaves, number of surgical wards with autoclaves	88 autoclaves	45 autoclaves	
Establish and maintain laundry services at every district hospital and referral hospital	Number of hospitals/year with adequate laundry services	Unknown	42 hospitals	

1.5 recovery beds per functioning operating theatre	PH: min 4, max 7 DH: min 2, max 4 PACU beds	65 PACU beds	117 beds, or min 2 beds / functioning OR for all hospitals (using current number of functioning ORs)	
All recovery beds with full monitoring capabilities and oxygen supply	Number of PACU beds with monitoring and oxygen	Unknown	Unknown	
All referral hospitals with full ICU services, minimum of 4 ICU beds	Number of ICU beds	2 beds at Kibungo (only hospital with ICU services)	3 ICU referral hospitals need an ICU facility/services (12 beds)	
Minimum standards of ICU-level care	Number of standard ICUs	Unknown	Unknown	
Ambulance services (2 ambulances per hospital	2-hour access, 1-hour for major trauma	100% within 2 hours		

Strategies:

1. Ensure uninterrupted power supply (UPS) to all hospitals
    a. Discuss with Rwanda Energy Group stabilization of the existing electricity source to all hospitals as electricity is important to all clinical care not surgery specifically. Providing a stable electricity source will both ensure availability of equipment at all hospitals and preserve equipment quality by preventing damage caused by inconsistent electricity.
    b. Provide all hospitals with an automatic generator as a back-up. In the event of a power outage, back-up generators at every hospital ensure safe SAO services can continue to be delivered.
2. Improve connectivity and consistency of water supply
    a. Encourage the Water and Sanitation Corporation to connect 14 district hospitals to national water system. A central water supply agent ensures consistent water access for all hospitals.
    b. All hospitals should have at least 1 water tank for back-up. A back-up water tank prevents challenges in providing SAO services in times of water shortages.
3. Improve oxygen infrastructure at the hospital and national level
    a. Encourage Ministry of Health to ensure all hospitals should have 30 cylinders and 30 regulators, and in-hospital oxygen distribution. Standardization of oxygen cylinder and regulator availability addresses inconsistencies between hospitals

and prevents a mismatch of cylinders and regulators, a challenge that can limit the number of patients receiving oxygen when needed.

   b. Encourage Ministry of Health to decentralize oxygen plants by establishing new oxygen plants in all provincial and referral hospitals, with at least one oxygen plant in each province, for a total of 5 plants. This will reduce oxygen delivery distance and time.
   c. All hospitals should have mural oxygen supply. Currently, mural oxygen is not available consistently.

4. Increase functioning operating theatres per hospital
   a. Rehabilitate all existing non-functioning operating theatres at all District and Referral hospitals to meet standards. Rehabilitation will increase the number of functional operating theaters and decrease the number of new theaters to be constructed.
   b. Rehabilitate existing functional OR's at all District and Referral Hospitals to meet minimum standards.
   c. Sustained maintenance of all ORs to maintain minimum standards.
   d. At least one operating theatre dedicated to maternity in each district hospital. Designated operating theaters for both surgery and maternity provides more consistent access to available operating theaters by different teams.
   e. Operating theatres should meet minimum requirements defined by Services Packages by the MoH.
5. Optimize surgical bed capacity
   a. Ensure an adequate number of surgical ward beds. Access to ward beds are essential for comprehensive, quality perioperative care.
      i. Provincial hospitals: 25 general surgery beds, maximum of 40 general surgical beds, 15 additional beds for trauma, maximum 26 for trauma.
      ii. District hospitals: 25 general surgery beds, maximum of 40 general surgical beds.
      iii. For the 6-year plan will upgrade 1/2 of the surgical beds
6. Increase the number of functional anesthesia machines to correspond with number of OTs and ICU capacity
   a. Provide maintenance to repair non-functional anesthesia machines to rehabilitate existing equipment.
      i. Maintenance plan should be integrated with biomedical team strategy.
   b. All hospitals to have at least 1 anesthesia machine per functioning operating theatre.
   c. All hospitals to have at least 1 additional back-up anesthesia machine.
7. Improve utilization and distribution of operating equipment
   a. Ensure all hospitals have appropriate operating room equipment as defined by Service Packages by MoH.
   b. Ensure all surgical wards have appropriate surgical supplies.
   c. Develop and implement biomedical engineering strategy by province, with 1 biomedical engineer per hospital

    d. Develop and implement regional and national equipment management guidelines.
    e. Develop and implement a maintenance strategy.
        i. Include scheduled preventative and regular maintenance servicing of equipment to avoid accumulation of non-functional equipment.
8. Improve sterilization capacity
    a. Ensure 1 sterilization unit per hospital.
    b. Ensure 1 autoclave per operating theatre, and 1 portable autoclave per surgical ward.
    c. Establish and maintain laundry services at every district hospital and referral hospital.
9. Standardize postoperative care infrastructure at all hospitals
    a. Ensure 1.5 recovery beds per operating theatre.
10. Expand intensive care unit (ICU) services
    a. All referral hospitals should have full ICU services with a minimum of 4 ICU beds.
    b. Define and implement ICU minimum requirements.
11. Optimize pre-hospital services
    a. Improve ambulance services, with minimum of 2 ambulances per hospital. Pre-hospital transport services ensure timely access to the appropriate level of facility required.

4.2.2 Increase pharmacy services

Objective: Provide consistent pharmacy services at the district, provincial, and referral levels.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Provide general anesthesia at all hospitals	Number of hospitals with GA available 100% of time	GA is available at 33 hospitals	9 hospitals need capacity for GA

Strategies:

1. Expand general inhalational anesthesia availability
    a. Provide consistent general anesthesia services at all district hospitals.

4.2.3 Increase utilization of current radiology services

Objective: To optimize radiology services through radiology training, rehabilitation of equipment, and expansion of services, including tele-radiology.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
4 ultrasounds in all district hospitals	Number of functional ultrasounds per hospital	30 hospitals with ultrasound access	80 ultrasound machines
C-arm in all referral hospitals	Number of days C-arm available	No C-arm at any of 4 referral hospitals	8 C-arms (2 at RR hospitals)
Radioprotection standards in all hospitals	Hospitals meeting radioprotection standards	Unknown	Unknown
Training course for SAO graduating residents in ultrasound use	Number of training courses per year	No ultrasound training courses	1 ultrasound training course
Tele-radiology system	All RR hospitals using the system	Unknown	Unknown

Strategies:

1. Improve and increase equipment availability
    a. Increase available ultrasounds to 4 per district hospital.
    b. Provide 2 C-arm machines in all Regional Referral hospitals.
    c. Require radioprotection standards to be met in all hospitals.
    d. Integrate ultrasound training course for SAO graduating residents into the required curriculum to ensure existing ultrasounds are utilized appropriately.
2. Develop tele-radiology system
    a. Develop tele-radiology system to ensure better utilization of centrally located trained radiologists at Regional Referral hospitals.

4.2.4 Improve laboratory and ancillary services to meet minimum standards

Objective: To improve laboratory and supportive ancillary services to meet minimum standards for providing safe, effective patient care.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Culture and sensitivity services for all district hospitals	Number of hospitals with Bacteriology Unit	Unknown	
Improved supply chain for reagents	Number of hospitals with required reagents	Unknown	
Improved equipment maintenance	Number of hospitals with maintained laboratory equipment	Unknown	
Referral system for lab specimens and tests	Number of hospitals that use referral system	Unknown	
Functioning pathology departments at all referral hospitals	Number of hospitals with Pathologist (per referral hospital)	1 pathologist (Butaro)	3 pathologists (Musanze, Kibungo, Karongi)
Develop Tele-pathology services	Number of hospitals that use telepathology	Unknown	RRH and PH pathology units
Pathology referral pathway for specimens and reports	Number of hospitals that use pathology referral pathway for specimens and reports	Butaro	3 hospitals

Strategies:

1. Improve laboratory services
    a. Culture and sensitivity services available at all district hospitals.
    b. Encourage MoH to improve supply chain for reagents.
    c. Improve laboratory equipment maintenance.
    d. Optimize and expand a referral system for lab specimens and tests.

2. Improve pathology services
    a. Encourage MoH to develop functioning pathology department at all referral hospitals.
    b. Develop tele-pathology services
    c. Develop a pathology referral pathway for escalating specimens and receiving reports.

4.2.5 Expand access to blood and blood products

Objective: To improve the national blood plan and strengthen the coordination of delivery and use of blood products.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Blood bank reserve minimums	Number of units available per hospital	Unknown	N/A
Reliable blood delivery system	Number of hospitals with blood available within 2 hours	Blood available within 2 hrs. at all sites but 3 (mean 1.3 hrs.), blood products less readily available (mean 12 hrs.)	None
Define conditions for appropriate use of blood and blood products	Number of hospitals in which guidelines available	N/A	N/A
Appropriate use training for SAO providers	Number of hospitals in which clinical audits done to ensure compliance	N/A	N/A
Drone delivery of blood products	Number of hospitals with blood delivery via drone	12	Unknown

Strategies:

1. Blood and blood products should be available within 2 hours
    a. Define the blood bank reserve minimum.
    b. Ensure an active and reliable blood delivery system from central storage to facilities of all levels.
    c. Define conditions for appropriate use of blood and blood products.
    d. Train SAO providers on appropriate use of blood and blood products
    e. Expand drone delivery of blood products where it is needed for reasons of difficult access.

4.2.6 Systematize supply chain

Objective: To strengthen and improve a centralized supply chain to provide consistent medicine, equipment, and other supplies to all hospitals.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Centralized supply system	N/A	N/A	N/A
Guidelines for medicine and medical supply donations	N/A	N/A	N/A
Local production of drugs, equipment, and supplies	N/A	N/A	N/A

Strategies:

1. Develop a centralized supply chain
    a. Enlist a project management taskforce to develop a centralized supply system. A centralized system will provide greater organization and a more efficient system for requesting and receiving supplies.
    b. Implement guidelines for medicine and medical supply donations.
    c. Lobby for local production of medicines, equipment, and supplies, and prioritize locally produced supplies when possible.

4.5 Service Delivery

Increasing service delivery is a key priority for increasing access to surgical services for all Rwandans. With strengthening of infrastructure and expansion of the SAO workforce, hospitals will have greater capacity to deliver the basic packages of surgical services.

Increasing surgical volume is essential to ensuring all Rwandans are able to access surgery when needed. The average total surgical cases per year for the 42 districts hospitals is 1703. In total, 71518 procedures were performed across the 42 district hospitals, and 21,374 procedures performed at the tertiary hospitals CHUK, CHUB, and RMH, a total of 92,892 procedures (in public facilities) in 2016 for a total catchment of 11,823,248. The surgical volume per population is 786 procedures per 100,000 populations at the district and provincial hospital level, compared to the LCOGs recommended 5,000 procedures per 100,000 populations. Of the 42 district hospitals, 10 can provide all 3 Bellwether procedures (laparotomy, cesarean section, and open fracture reduction). All 42 district hospitals can provide cesarean section, however only 31 hospitals could perform laparotomy and only 10 provided open fracture repair. To ensure all district hospitals are Bellwether-capable, there must be a focus on increasing capacity for laparotomy and open fracture repair. In terms of SAO physician distribution, there are 9 surgeons, 2 anaesthesiologists, and 14 obstetricians across all 42 district hospitals. Most SAO providers are concentrated in the tertiary and teaching hospitals. Redistribution of SAO providers and assignment of new graduates will ensure sufficient staffing for surgical services at all facility levels. Perioperative mortality rate is reported by 76.2% of district hospitals, compared to the LCOGs goal of 100% tracking. Though use of the WHO checklist is variable, pulse oximetry is consistently used.

4.5.1 Prioritize redistribution of SAO physicians and providers to district, provincial, and referral hospitals

Objective: Equally distribute SAO providers to ensure sufficient SAO staff at all hospitals for the safe delivery of essential services to the catchment area.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Referral hospitals: 2 surgeons, 1 anesthesiologist, 2 OBGYNs	SAO providers per hospital	42 surgeons, 13 anesthesiologists, 14 OBGYNs	None
Provincial and district hospitals: 1 surgeon, 1 anesthesiologist, 1 OBGYN, 1 OPHT	SAO providers per hospital	9 surgeons, 2 anesthesia, 14 obstetricians	101 SAO providers
PH to have 1 orthopedic	Number of PHs	0	4

surgeon	with orthopedic surgeon		
Referral hospital: 48 anesthesia techs	ATs per referral hospital	75	69
PH: 10 anesthesia techs	ATs per PH	16	24
DH: 6 anesthesia techs	ATs per DH	157	71
Provincial hospitals: 12 surgical nurses (including morning and evening shifts); District hospitals: 10 surgical nurses	Nurses per surgical ward	257 full-time surgical nurses	91 nurses
Provincial hospitals: 1 ICU nurse per bed in ICU	Nurses per ICU bed	Unknown	16
2 theatre nurses per operating theatre	Nurses per operating theatre	Unknown	182

Strategies:

1. Implement minimum staffing requirements
    a. Ensure 2 surgeons, 1 anesthesiologist, and 2 OBGYNs staff all referral hospitals
    b. Assign 1 surgeon, 1 anesthesiologist, 1 OBGYN and 1 OPHT to each provincial and district hospital.
    c. PH to have 1 orthopedic surgeon
    d. Referral hospital to have 48 anesthesia techs
    e. Provincial hospital to have 10 anesthesia techs
    f. District hospital to have 6 anesthesia techs
    g. Ensure 12 surgical ward nurses at each provincial hospital, and 10 surgical ward nurses at each district hospitals.
    h. Ensure 1 ICU nurse per ICU bed in provincial hospitals.
    i. Ensure 2 operating theatre nurses per theatre at all hospital levels.

4.5.2 Increase volume of outreach surgery

Objective: To increase the frequency and scope of outreach services to support increased volume of surgical services at the district and provincial levels and strengthen provider training to expand services and build competency.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
12 CHUK outreaches per year	Number of outreach trips per year	4 outreach trips per year	8 additional outreaches
6 RMH outreaches per year	Number of outreach trips per year	1 outreach trips per year	5 additional outreaches
5 CHUB outreaches per year	Number of outreach trips per year	0 outreach trips per year	3 outreaches
Ophthalmology outreaches	Number of outreach trips per year	10 per surgeon per year	5 per surgeon per year

Strategies:

1. Increase CHUK outreach
    a. Increase trips from 4 to 12 per year.
2. Increase RMH outreach
    a. Increase trips from 1 to 6 per year.
3. Initiate CHUB outreach
    a. Partner CHUB with outreach sites.
    b. Organize 3 trips per year.
4. Increase Ophthalmology outreach
    a. Increase trips from 10 per surgeon per year to 15 per surgeon per year total

4.5.3 Formalize mentorship between referral hospital and district hospitals

Objective: To implement existing plan for pairing district and referral hospitals in a formal mentorship structure.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Implementation plan for mentorship	None	None	None

Strategies:

1. Implement recent MOH plan (NO 20/1291/MIN/2017) for coupling district and referral hospitals

a. Implement the strategic plan for mentorship.
    i. Include defining mentorship pairs, establishing expectations for the mentor and mentee hospitals, and formalizing communication mechanism and schedule

4.5.4 Standardize procedures offered at Provincial and District level

Objective: To ensure consistent availability of surgical services across all hospitals of the same level, with increasing complexity from the district to tertiary level.

Output Framework:

<table>
<tr><th rowspan="2">Expected Output</th><th rowspan="2">Indicator</th><th colspan="3">Values</th></tr>
<tr><th>Baseline</th><th>Needs</th><th></th></tr>
<tr><td>Minor surgeries at all facilities</td><td rowspan="6">Hospital able to provide assigned procedures >75% of the year</td><td rowspan="6">None</td><td colspan="2" rowspan="6">None</td></tr>
<tr><td>Bellwether procedures at all district hospitals</td></tr>
<tr><td>Orthopedic surgeries (besides open fracture reduction) at referral hospitals</td></tr>
<tr><td>Urology at teaching hospitals</td></tr>
<tr><td>Neurosurgery at teaching hospitals</td></tr>
<tr><td>Plastic surgery at teaching hospitals</td></tr>
<tr><td>Workforce sufficient for providing defined essential services</td><td>None</td><td>None</td><td colspan="2">None</td></tr>
<tr><td>Infrastructure sufficient for providing defined essential services</td><td>None</td><td>None</td><td colspan="2">None</td></tr>
</table>

Strategies:

1. Ensure that the basic surgical procedures package is available at each DH
    a. Ensure the complete package of procedures (table) can be performed at district and provincial hospitals, including:
        i. Minor surgery at all facilities.
        ii. Bellwether procedures at all facilities

iii. Other orthopedic surgery (other than open fracture reduction) at referral hospitals
iv. Urology at teaching hospitals
v. Neurosurgery at teaching hospitals
vi. Plastic surgery at teaching hospitals

Anesthesia	Basic	Emergency	General	OBGYN	Ortho	Specialty	Urologic
General anesthesia	Biopsies	Burn Management	Appendectomy	Caesarean delivery	Amputation	cataract	Cystostomy
Ketamine sedation	I&D	Chest tube insertion	Contracture release/ grafting	D&C	Closed fracture	cleft lip	Urethral stricture dilation
Regional blocks	Circumcision	Cricothyroidotomy/ Tracheostomy	Hernia repair	Obstetric fistula repair	Clubfoot repair	neonatal/ pediatric surgery	Scrotal emergencies
Spinal	Removal foreign body	Resuscitation	Hydrocele	tubal ligation/vasectomy	Drainage of osteomyelitis	epistaxis	Paraphymosis
	Suturing	Central line placement	Laparotomy	Laparotomy	Joint dislocation	dental extraction	
	Wound debridement		Perianal abscess	Cerclage	open fracture repair	dental filling	
			anal fistula or fissure	Cauterization of condyloma I & D Bartholin Marsupialization Hematocolpos			

Table. Essential surgical procedure list (same as table 1)

b. Establish workforce and infrastructure needs to these essential services.

4.5.5 Improve the quality of surgical care

Objective: To standardize preoperative, intraoperative, and postoperative procedures to improve quality of services and maximize efficiency

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Informed consent and preoperative patient marking	Consent documented in HMIS for all patients	None	None
Anesthesia assessment and consent	Assessment/ consent documented in	None	None

	HMIS for all patients		
Use of WHO checklist intra operatively	WHO checklist utilization rate	75% of hospitals use WHO checklist regularly	None
Standardize postoperative documentation, including postoperative complications, deaths, adverse events	POMR, adverse events rates, SSI rates	27 hospitals currently report collecting POMR	15 hospitals
Efficient perioperative patient flow	Patient wait time for elective surgical admission	None	None
Reinforce Trauma training course, offered 2x/year for all providers (nurses, EMT, SAO providers)	Number of providers completed course per year	0	2
Reinforce Anesthesia training course, offered 2x/year for anesthesiologists and anesthesia techs on regional anesthesia and pain control	Number of providers completed course per year	0	2
Reinforce OBGYN ALSO training course, offered 2x/ year for OBGYN and Family Practitioners	Number of providers completed course per year	3	5

Strategies:

1. Improve perioperative services
    a. Mandate informed consent of patients preoperatively.
        i. Including procedure consent, patient site marking, and anesthesia assessment and consent
    b. Prioritize use of the WHO intraoperative checklist for every operation.
    c. Standardize postoperative documentation.
        i. Include postoperative complications, deaths, and adverse events.
    d. Maximize efficiency of perioperative patient flow.
        i. Include preoperative intake, OR transport, OR scheduling, postoperative recovery, and discharge.

e. Reinforce Trauma training course, offered 2x/year for all providers (nurses, EMT, SAO providers)
f. Reinforce Anesthesia training course, offered 2x/year for anesthesiologists and anesthesia tech on regional anesthesia and pain control
g. Reinforce OBGYN ALSO training course, offered 2x/ year for OBGYN and Family Practitioners

4.5.6 Improve the referral system

Objective: To strengthen the referral system from district level to higher levels of care by standardizing the referral process and reducing delays.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Designated referral pathway by province	Appropriate Referrals Index (ARI) = Referrals per month that fit the referral criteria/total referrals; or Rate of formally referred patients	High number of referrals from the South and East provinces, compared to the North and West provinces	None
Quarterly feedback from tertiary hospitals to district hospitals			None
National triage protocols for timely transfers	Transfer time = time of referral to time of care delivery	Estimated 35% of transfers delayed (Nkurunziza et al, 2016)	None

Strategies:

1. Define criteria for referral to higher level of care for surgical procedures.
    a. Develop designated referral pathway by province for SAO services
        i. Define where specific surgeries should be referred
    b. Create a feedback mechanism to deliver information from referral hospitals to district hospitals on a quarterly basis, through the established mentorship program, to create awareness and identify areas of concern in the referral system.

2. Reduce delays in emergent referrals
    a. Develop national triage protocols for common urgent conditions to facilitate timely transfers.

4.5.7 Accelerate ongoing accreditation process

Objective: To ensure implementation of existing clinical guidelines required in facility accreditation process.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
All hospitals compliant with recommended quality improvement processes	None	None	None

Strategies:

1. Increase utilization of guidelines as defined by existing accreditation process.
    a. Ensure all hospital directors implement recommended QI processes.
        i. To include infection control, WHO checklists, appropriate laboratory testing, use of blood products, etc.

4.6 Workforce

The surgical workforce (surgeons, anaesthetists, obstetricians, nurses, etc.) has been identified as a key barrier to providing the necessary surgical services for Rwanda.

In 2017, there were a total of 94 total SAO providers (51 surgeons, 15 anesthelogists, 28 OBGYN) which translates to a density of 0.8 providers per 100,000 population. LCOGs recommends a minimum of 20 per 100,0000 population. At the district level, there are a total of 25 SAO providers for 42 hospitals (9 surgeons, 2 anesthesiologists, and 14 obstetricians). At the tertiary level, there are 69 SAO providers. This significant gap at the district level, is partially addressed through the use of non-surgeon physician providers, some of whom are privileged in surgery, and perform c-sections and some abdominal surgeries. Anesthesia techs provide essentially all of the anesthesia care at district level, in the place of an anesthesologists. Despite this task shifting, the total SAO gap given the population is substantial. In regards to ancillary staff, (surgical nurses, nursing circulators, anesthesia techs,etc) the need is also quite high and demands attention. At the district level, there are no full time radiologists, and one pathologist.

4.6.1 Specialist Training

Objective: To increase the capacity to train more residents and subspecialty providers needed for Rwanda.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
15 Anesthesiology residents	Number of Anesthesiology trainees / year	10	5
35 GS residents	SAO/trainee	16	19
38 OBGYN residents	SAO/trainee	20	18
3 ENT residents	Number of ENT trainees / year	1	2
4 Ophthalmology residents	Number of ophthalmology trainees / year	2	4
2 Urology residents	Number of urology trainees / year	1	1
3 NSG residents	Number of NSG trainees / year	1	2
5 Orthopedic residents	Number of Orthopedic	2	3

	trainees/year		
9 Oral surgeon residents	Number of oral surgery trainees / year	0	9

Strategies:

1. Increase the number of graduating SAO providers from the University. By increasing the number of providers graduating each year, the SAO density will significantly improve and therefore the surgical volume as well. To do this, the societies and educational institutions have decided upon the following changes:
    a. Expand anesthesia residency to a graduating class of 15 per year.
    b. Expand the general surgery residency to a graduating class of 35 per year (20 from University of Rwanda, and 15 from COSESCA)
    c. Expand the OBGYN residency to a graduating class of 38 per year (30 from University of Rwanda, and 8 from ECSACOGS)
2. Increase the number of surgical subspecialists. Currently the breadth of subspecialties offered throughout the country is low. The goal is to increase not only the number of providers already being trained, but also to expand upon the current training programs available to meet the population needs. This also includes expanding to other fellowships in the future to include hepatobiliary vascular, colorectal, endocrine, surgical oncology and plastics.
    a. Increase ENT residency to a graduating class of 3.
    b. Increase Ophthalmology residency to a graduating class of 4.
    c. Increase Urology residency to graduating class of 2.
    d. Increase Neurosurgery residency to a graduating class of 3.
    e. Increase Orthopedic surgery residency to a graduating class of 5.
    f. Increase Oral-dental surgery residency to a graduating class of 9.

4.6.2 Improve existing SAO skills and knowledge

Objective: To enhance health care delivery through support and development of continued medical education (CME) programs for physicians and ancillary staff.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
CME guidelines and requirements	None	None	NA
Development of CME curriculum for providers	None	None	NA
CME online resources development, logging of CME	None	None	NA

Strategies:

1. Continued medical education (CME) is an imperative notion for providers to grow in their capabilities and knowledge base. In addition, it provides an opportunity to be up to date on the current treatments and guidelines.
    a. Establish CME guidelines and requirements for health professionals at all levels.
        i. Mandate providers to log CME credits.
            1. A system will be created that will provide a platform for providers to log their CME hours for accountability. This will be overseen by the Rwandan Medical and Dental Council (RMDC).
    b. Each professional society should develop a CME curriculum for their providers. This curriculum will be open to all providers in each designated field.
        i. CME activities will maintain, develop, and increase knowledge, skills, and professional performance.
        ii. CME will include lectures, case conferences, small group discussions, and self-study activities.
        iii. CME will be aimed at improving provider's ability to use evidence-based clinical decision-making skills to improve health care services.
        iv. Develop a culture of lifelong learning.
    c. Gain access to international CME online resources.
        i. Societies will advocate for their providers to have access to online free resources to streamline CME efforts.

4.6.3 Further training of non-surgeon physician providers to perform Bellwether procedures

Objective: To prioritize training of non-surgeon physician providers to perform Bellwether procedures to meet the demand of surgical care needed at the district hospital.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Train 100 non-surgeon physician providers / year, credentialed to perform Bellwether procedures	None	50	50
Implement expanded REST courses, 6x/ year	None	3	3
Create task force over non-surgeon physician providers certification and credentialing. Reinforce	None	None	1

accepted procedure list			

Strategies:

1. Increase the number of non-surgeon physician providers trained per year in on surgical procedures, C-sections, basic anesthesia. By increasing the number of non-surgeon physician providers trained to provide surgical care, the distribution of providers across the country will significantly improve and the provider/population ratio will increase.
    a. Train 100 non-surgeon physician providers per year who are credentialed to perform the Bellwether procedures. Plan to develop further training centers at Kibungo, Kibuye, and Ruhengeri for non-surgeon physician providers to be trained in surgical care.
2. Expand REST course from 3 days to 1 week and include Bellwether procedures.
    a. Implement the expanded REST course six times per year.
    b. Include non-technical skills for surgeons into the curriculum.
3. Improve certification and credentialing process for non-surgeon physician providers to carry out procedures at the district level with protection. Currently, credentialing of non-surgeon physician providers was cited as a major barrier for many non-surgeon physician providers who stated they were capable of performing surgery but were not credentialed.
    a. Create a taskforce focused on non-surgeon physician providers certification and credentialing to perform surgical procedures.
    b. Make sure there is agreement on the already in place procedure list for non-surgeon physician providers to perform.
    c. Determine a reasonable timeline for certification and credentialing.
    d. Reinforce the expedited credentialing/recertification process for non-surgeon physician providers already practicing with prior surgical experience through RMDC.

4.6.4 Improve intern training of surgical procedures and anesthesia

Objective: To expand on the current intern curriculum ensuring more robust exposure to surgical disease, procedures, and anesthesia care.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Require that all interns do Basic Surgical Skills course during intern year	Number of interns completed BSS	Unknown	NA
Discuss with hospital and university staff to mandate that all interns	standardization of intern	Currently 6 months	NA

spend a minimum of 9 months on surgery & obstetrics	curriculum	on surgery and OB	
Work with intern board to develop set curriculum for surgery and OBGYN cases	Case logging by interns	None	NA

Strategies:

1. Expand on the current intern training of surgical procedures.
    a. Require that all interns go through the Basic Surgical Skills course during their intern year.
    b. Discuss with hospital and university staff a mandate that all interns spend a minimum of 9 months on surgery & obstetrics.
2. During their surgical service, interns must be exposed to adequate numbers of laparotomies, open fractures, and trauma.
    a. Work with intern board to develop a set curriculum with specific number of cases for each category that interns must be exposed to as second assist and first assist.
    b. Interns to be logging cases that will be reviewed prior to finishing of intern year to ensure has met requirements.
3. During their obstetric service, interns must be exposed to adequate numbers of C-sections
    a. Work with intern board to develop curriculum and decide on set number of C-sections that all interns must be exposed to, as second assist and first assist.
    b. Again, interns to log these cases to be reviewed.

4.6.5 Improve distribution of SAO providers to rural settings

Objective: To improve the distribution of all SAO providers throughout the country by increasing the provider density in the rural areas and decreasing the attrition of providers.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Provide financial incentives for SAO providers to serve in certain areas for so many years (5, 10, 15, 20) as well as career development opportunities	SAO provider attrition rate from rural hospitals/ year	Unknown	NA
Provide additional services for families serving in rural areas	None.	None.	NA

Ensure deployment of surgeon, anesthesia, OBGYN, and admin as a functional unit to DHs	SAO units deployed / year	None.	NA
Increase the number of rural rotations for SAO residents: 12 residents/hospital, increase to 4 hospitals	Number residents sent/ year to rural hospital	4 residents (general surgery)	NA
Develop minimum certification requirements for active retirees to practice, increase to 10 providers	Retirees practicing/year	5 SAO providers	NA
Develop an attractive package to graduating surgical residents like others offered in the region through COSECSA	Number residents sent/ year to rural hospital	4.8 graduating providers / year	NA
Expand credit and saving scheme (through Mutuelle AID group) so that physicians can get access to affordable loans at PH and DH, increase to 20 residents	Number of residents per program enrolled	10 residents	10 residents
Develop requirements for dual practice status	None.	NA	NA

Strategies:

1. Improve disbursement of SAO providers to rural areas and improve equal distribution of these providers throughout the country. One of the major barriers to care is not enough providers in the rural areas capable of performing the Bellwether procedures. There is a drastic need for more SAO providers in rural areas and in certain provinces in Rwanda. The below strategies will be implemented to improve the distribution of providers:
    a. Provide financial incentives to SAO providers to serve in rural areas (designated areas to be decided upon). These incentives will be further supplemented by bonuses, based on number of years serving in these areas (3, 6, 9, 12 years).
        i. SAO providers that remain in rural areas will be provided the same career development opportunities as those practicing in urban areas (CME, promotions, research opportunities).
    b. Provide additional services to the provider's family for serving in rural areas. Like other programs around the globe, further incentives to work in rural areas will be focused on the provider's family and children.
        i. Education for children, modern housing conditions, reliable internet, reliable electricity.
    c. Ensure deployment of surgeon, anesthesia, OBGYN, and administrator as a functional unit to DHs for providers to be most effective.

        i. For surgery or anesthesia providers willing to serve in rural areas, the providers will be clustered/sent together to a certain hospital to ensure full staffing functionality.
    d. Increase the number of rural rotations for SAO residents to 12 residents/hospital and increase to 4 hospitals.
        i. Evidence suggests that resident training in rural areas can lead to improvement in rural retention.[7]
2. Provide part-time positions for retirees to continue practicing in rural areas. Currently there some practicing retired physicians that are applying this model to meet the surgical care gap, but we would like to expand this program to increase the number of retirees participating, incentivizing them not to retire into private practice.
    a. Develop minimum certification requirements for active retirees to continue to work. Plan to increase to 10 retired providers.
3. Incentivize providers to remain in country.
    a. Develop an attractive package to graduating surgical residents that will motivate graduates to remain in Rwanda. These packages have been offered in other East African countries through COSESCA.
    b. Expand the current credit and saving scheme to allow physicians access to affordable loans at PH and DH. Will expand this program to 20 residents per year.
4. Create a special statute of health professionals to include dual practice.
    a. Develop requirements for dual practice status to increase the number of private providers who also provide care in the public sector.

4.6.6 Increase interest in surgery, anesthesia, and OBGYN

Objective: To address the shortage of SAO providers by appealing to medical student's and undergraduate student's interest in these fields.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
For undergrads, application to shadow a SAO and at the medical student level, increase opportunities to rotate and be around surgery, formation of a SAO interest group	increase in applications for SAO residency spots / year	None	NA
Yearly open house: To include RSS, Women in Surgery in planning and co-hosting	Number attendees to open house	NA	NA

Strategies:

1. Strengthen existing mentorship program in medical schools and undergraduate studies to gain exposure and interest in SAO fields.
    a. At the undergraduate level: provide applications for students to shadow a SAO provider both in the city and rurally.
    b. At the medical student level: increase opportunities to rotate and shadow SAO providers.
        i. Begin a SAO interest group
        ii. Hold surgical workshops for medical students put on by residents to teach knot tying, scrubbing, suturing, etc.
    c. Yearly open-house meetings by the different professional societies, marketed to students.
        i. Further exposure to medical students and undergraduates to SAO fields and professional organizers.

4.6.7 Increase training of non-physician anesthesia providers

Objective: To increase the number of anesthesia techs graduating per year and increase the capacity of non-physician anesthesia providers by expanding the current training curriculum.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Increase the number of non-physician anesthesia provider's trainees to 100 / year	Number trainees/year	Unknown	Unknown

Strategies:

1. Increase the number of graduating non-physician anesthesia providers to 100 graduates per year.
    a. Further develop the continuing medical education program for non-physician anesthesia providers to ensure professional growth, quality of care, and career advancement.
    b. Develop a mentorship program for each hospital to have a designated anesthesiologist that mentors the non-physician anesthesia providers at that given facility.
        i. Ensure adequate support for non-physician anesthesia providers

ii. Provides senior anesthesiologist backup for non-physician anesthesia providers on-call always.

4.6.8 Expand opportunities for SAO subspecialist training

Objective: To improve the availability of subspecialty training programs and subspecialty services offered in Rwanda through the expansion of training opportunities.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Identify promising fellowship candidates interested in subspecialties early in residency training and provide a mentor for development/application	Number subspecialist trainees applying in out of country programs/year	Unknown	NA
Decide what specialties are a priority to develop (pediatric surgery, minimally invasive, surgical oncology, etc.)	none.	0	3 programs
Write curriculum for Rwanda-based subspecialist fellowship training programs	Number subspecialist fellowship positions filled / number subspecialist fellowship positions available in Rwanda	NA	NA
Set up incentives for subspecialists to return to Rwanda to practice	subspecialists who train abroad and do not return/year	2 residents	NA

Strategies:

1. Support residents' interest in subspecialties and encourage out-of-country training through COSECSA and other programs to gain more specialized skills that are not currently available in Rwanda.
    a. Identify promising fellowship candidates early in residency training to provide a mentor and help guide fellowship application process and career development.
2. Expand current subspecialty fellowships offered in Rwanda.

    a. Decide what subspecialties are priority to develop new training programs (pediatric surgery, minimally invasive, surgical oncology, etc.).
    b. Write curriculum for Rwanda-based subspecialist fellowship training program in conjunction with the University of Rwanda/Ministry of Education.
3. Incentivize subspecialists currently training abroad to return after completing training
    a. Set up financial and non-financial incentives for subspecialists who train abroad to return to Rwanda and provide care.

4.7 Information Management and Research Capacity

A surgical system is incomplete without attention to information management and research capacity building. Information management includes developing systems for accurate data collection around diseases and outcomes. This information can be used to inform policy and quality improvement at the facility and national levels with evidence-based decision-making. Currently, although most hospitals do employ personnel for records maintenance, there is inconsistency in record keeping, data collection, and record maintenance between facilities. There is also some discrepancy between registries on paper records and electronic records, and in the indicators collected at different facilities, specifically surgical indicators like POMR and minor surgery data, which may be incomplete or missing.

Disease-specific registries may be created, which include a trauma registry and a cancer registry, and can lead to the improvement of efficient triage and referral systems, or new treatments becoming available. To collect surgical indicators, they should be integrated into the current record-keeping process for ease of use. Decisions around surgical indicators and registries can best be overseen by a data taskforce, responsible for reporting progress to the surgical steering committee. These findings may be reported back to the clinical team through consistent morbidity and mortality conferences where clinicians discuss what issues have arisen in the facility that may have been avoidable or can be corrected in the future.

Research is an integral part of improving health systems by testing clinical questions and making improvements in patient management and care. When research is integrated into the clinical training of residents, it creates a culture of inquiry within the clinical team and throughout the medical education system in the country. Requiring research projects and presentations by the residents, and in turn requiring mentorship by the faculty clinicians can facilitate a collaborative research environment and encourage quality improvement and evidence-based practice. Currently there are monthly QI projects being conducted at hospitals across Rwanda, and many research projects underway, a few of which are pertinent to surgery. As more research is planned and pursued by surgery, anesthesia, and OBGYN, specific research priorities may be identified by clinical teams or by the societies to improve care based on patient needs and advancements sought by each respective field.

4.7.1 Integrate surgical indicators into existing data collection to inform decision-making and policies

Objective: To integrate the collection of surgical indicators into existing data collection at the hospital-level and ensure that these indicators are being used to inform decision-making and policy-making.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Focus on development of a registry for indicators that will be reported quarterly	Number of hospitals/year reporting indicators	None	42
Provide hospitals with hardware and software for data collection	Number of hospitals with standard HMIS	Unknown	42
Bandwidth at all hospitals above 10MB	Number of hospitals with 10MB internet bandwidth	Unknown	42
Data taskforce will compile a report that should be presented to the steering review	Number of reports/year	0	1

Strategies:

1. Create data taskforce
    a. Focus on implementation of the current registry for indicators, to be reported quarterly and used to inform decision-making at the facility-level. The taskforce will work with the data manager at each district hospital. When this indicator data is aggregated at a national level, it will allow us to understand the burden of surgical disease in Rwanda and the current availability of services at different levels of the health system, and where to prioritize improvements.
    b. Each hospital shall be equipped with the proper software and hardware in order to properly collect the indicators and input into HMIS. There will be yearly equipment checks for maintenance of this equipment as well.
    c. Each hospital to have internet bandwidth at or above 10MB in order to strengthen data collection, service delivery, and adherence to evidence-based practices and guidelines.
    d. Data taskforce will compile a report to be presented to the steering committee to inform budgetary decisions, as well as standard-of-care policies and staffing decisions. The data taskforce should publish reports on a consistent basis to provide the most current data to the steering committee.

4.7.2 Integrate NSOAP data collection with existing data surveillance systems

Objective: To integrate indicators specific to the priorities of the NSOAP into existing data collection to ensure improvement of surgical systems in a standardized manner.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Integrate tracking of surgical volume by type of procedure performed into HMIS surgical volume per hospital	% of registry properly filled / hospital surgical volume / hospital	0	42
Review the co-payment or strengthen the outreach strategy to enhance healthcare financing protection by reducing to 0% the households that experience catastrophic expenditure	Catastrophic and impoverishing expenditure	45,2% protected against catastrophic expenditure	EICV and Hospital Finance Report and Accountant cash books.
Annual audit of data collection to evaluate relevance and use at local facilities	Audit/year	0	42 hospitals
Create registry of SAO specialists as well as ancillary providers e.g. nurse anesthetists	% of registry properly filled /hospital	None	42 hospitals
Improve and spread use of specific registries beyond referral hospitals for trauma, cancer, and case-logging	% of registry properly filled / hospital	Unknown	42 hospitals

Strategies:

1. Revise surgical data collection at the facility level
    a. Reformulate current HMIS tracking of surgical volume by type of procedure performed to be more detailed, to understand what surgical procedures are available and the burden of disease for different surgically-treatable conditions. A few activities that should be pursued to achieve this are:
        i. Update and standardize logbooks to include risk stratification information (POMR).
        ii. Select two key anesthesia drugs to integrate into the tracer medication on HMIS to track inventory and stock-out of required anesthesia supplies.
        iii. Select two key surgical consumables to integrate into tracer consumables on HMIS (surgical blades, vicryl suture) to track inventory and stock-out of required surgical supplies.
        iv. Ensure this information is reported at a facility, regional and national level to drive quality improvement and decision-making.
        v. Standardize a patient referral document to understand where, when and how many patients are being referred to different facilities, and to drive improvement in the referral system countrywide.
    b. Advocate for inclusion of patient income, hospital/clinic costs, transportation questions in DHS household survey. This should be done at the national-level and is a priority of the entire health system, not just the NSOAP.
    c. Conduct an annual audit of data collection to evaluate the relevance of the data being collected, and to ensure it is being used at local facilities to drive improvements.
    d. Create a registry of SAO specialists as well as ancillary providers (e.g. nurse anesthetists) to ensure adequate distribution of staffing to meet the burden of disease at different levels of care and in different regional areas of Rwanda.
2. Improve and spread use of specific registries beyond referral hospitals to allow data collection on surgically treated disease categories that may inform a better understanding of the burden of these conditions and may drive resources toward surgical services.
    a. Trauma registries for patients admitted through the emergency department as trauma patients who require imaging and possibly surgery.
    b. Cancer registry for patients who present with cancer, to understand their stage at presentation, and the clinical decision-making around whether they may be treated with surgery or require other medical management.
    c. Case logging by residents and physicians can inform the staffing requirements, as well as the proficiency of training of the medical practitioners.

4.7.3 Quality Improvement

Objective: To use the clinical information collected to continually inform improvements in quality of care that is provided to patients at every level of the surgical system.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
The Ministry of Health creates informational booklets and reports in several key health areas annually for the NSOAP	Reports/year	None	1 national report
Produce quarterly reports for each hospital. Reports reviewed by DH staff at least biannually, and by steering committee to identify areas for quality improvement and future projects	Reports/quarter	0	42 reports
Create performance-based recognition for best facility at implementing NSOAP and for SAO team members who exceed targets	None	None	None
Utilize costing index for surgical services to track regional differences in procedure costs and ensure patients are getting a high-	Costing index	None	Unknown

value service			
Hold biannual meeting of representative surgeon or non-surgeon physician providers from each DH to discuss QI issues	2 meetings/year	None	2 meeting
Improve safety through implementing a culture of medical error disclosure	M&M/month/ hospital	Unknown	42 M&Ms

Strategies:

1. Systematize the dissemination of results
    a. The MoH creates informational booklets and reports in several key health areas, on a yearly basis to follow the priorities of the NSOAP and support the progress with hard data collected at the facility level and aggregated at the national level.
    b. Produce quarterly reports for each hospital, which will be reviewed by DH staff at least biannually, and by the steering committee to identify areas for quality improvement and future projects. Once data is consistently collected and analyzed, decision-making and project prioritization should always be supported by the data.
    c. Create performance-based recognition of facilities that have shown commitment to implementing NSOAP and recognition of SAO team members exceeding NSOAP targets. This recognition can provide an incentive for individuals and teams to work together toward the goals of the NSOAP and to hold them accountable to the targets.
2. QI accountability
    a. Morbidity and mortality conference should be held monthly at district level and province level. M&M conference allows teams and departments to reflect on avoidable or unavoidable harm to the patient and creates a venue for discussion of opportunities for improving systems and teamwork, and for tracking errors at the facility-level.
    b. Utilize costing index for surgical services to track regional differences in procedure costs and ensure patients are getting a high-value service. This will allow comparison of costs rendered to the patient and insurance providers for surgical services and encourage standardization of these costs for patients presenting to different health facilities throughout Rwanda.
    c. MoH to hold biannual meeting of representative surgeon or non-surgeon physician providers from each DH to discuss QI issues and share best-practices for improvements at their respective hospitals. This will open a dialogue among

physicians working in the same capacity at different facilities and may expedite improvements through sharing experiences in an open forum. The minutes from these meetings should be shared with the professional societies.

d. Improve safety through implementing a culture of medical error disclosure amongst medical practitioners. Medical errors are an unfortunate part of providing medical care but must be examined and acted upon to avoid the same mistakes in the future. Error reporting can expedite the time it takes to improve care delivery and change policy to streamline system. Creating a culture of disclosure will encourage practitioners to share their experiences so that everyone can benefit.

4.7.4 HMIS maintenance

Objective: To create a task force and network of data management professionals at the facilities, responsible for making data useful and leveraging the power of HMIS to inform health system improvements.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs
Survey data managers at all levels to understand current capacity	Completion of survey by 2020	NA	42 hospitals surveyed
IT Taskforce to create a system with a requirement of data collectors, analyzers, and HMIS data cleaning, dependent on the level of facility	IT support/hospital	38 hospitals with personnel maintaining records	4 personnel

Strategies:

1. Leverage data management personnel for every district hospital
    a. Survey data managers at all levels to understand their current role and responsibilities.

b. IT Taskforce to standardize expectations of data collectors, analyzers, and HMIS data cleaning, for each level of facility. There must be an informed taskforce to identify the requirements of HMIS at different facility levels and to ensure the inputs and outputs are appropriate and useful. Data management personnel at these facilities can provide feedback to the taskforce on how the HMIS is working and being maintained within their facility. The quality of data and of data analysis, distribution, and usefulness must be revisited to make improvements on a regular basis.

4.7.5 Private sector reporting

Objective: To work with the private sector as an integral part of surgical systems strengthening and implementation of the NSOAP, and to hold those parties accountable to the same high standards as the public sector.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Establish standard registration form for all NGOS and private sectors with SAO activities, so that MoH receives quarterly updates on NSOAP progress	4 times/year	None	4 reports

Strategies:

2. Mandate reporting by NGOs and private hospitals
    a. Establish standard registration form for all NGOs and private sector players with SAO activities, allowing the best mapping of surgical services and capacity

possible at all facilities. This will also enable more standardization of care regardless of whether a patient presents to a public or private facility.

b. MoH receives quarterly updates on NSOAP progress from private sector players and NGOs. Quarterly reporting will ensure the MoH can account for the SAO activities of these players available in Rwanda and will hold them accountable to the same high standards outlined in the NSOAP that have been designed for the public sector.

4.7.6 Build research capacity in the surgical system

Objective: To develop a network of research centers at specified hospitals and a system for prioritizing clinical investigations that will improve quality of care and share best practices across district hospitals.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Designate 8 DHs to be research centers where residents and physicians can conduct research projects	Number active research centers/year	2 hospitals	2 research centers
RSS, OBGYN Society, Anesthesia Society to assist in development of projects	Active projects/year	None	None

at the DH level and provide statistical support to surgeons and residents			

Strategies:

3. Improve research capacity at the DH level
    a. Designate 8 DHs to be research centers where residents and physicians can conduct research projects in collaboration. These research centers may provide a gathering place for mentorship, research methodology training, and project design and execution. This research center designation can be expanded to any hospital that is interested in hosting SAO research projects and has been determined to have the organizational capacity to execute.
    b. RSS, OBGYN Society, Anesthesia Society to assist in development of projects at the DH level and provide statistical support to surgeons and residents. The societies are uniquely positioned to inform the priorities for research in their respective fields and to select and support projects with a high value proposition for improving patient management.

4.7.7 Increase the intellectual capital and incentives for research

Objective: To provide incentives to encourage the development of a robust and sustainable network of researchers and mentors.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	**Needs**
Integrate research productivity into the continuing professional development (CPD) points	research points awarded / year	None	None

system			
Encourage research presentations at the facility level, where researchers may present their findings to the staff	Number of presentations/ year at research centers	None	None
Encourage facility leadership to recognize research activity in promotion considerations	None	None	None
Increase budget for research grants	Annual budget for research	Unknown	Unknown

Strategies:

4. Create staff incentives for research involvement
    a. Integrate research productivity into the continuing professional development (CPD) points system to award physicians who dedicate some of their time to mentorship and research involvement.
    b. Encourage research presentations at the facility level, where researchers may present their findings to the staff. This may be integrated into a monthly conference with M&M or can become a separate initiative to drive awareness of ongoing research efforts at the facility so that others can become involved or inspired.
    c. Encourage facility leadership to recognize research activity in promotion considerations as a highly-valued use of clinician time. The time that physicians spend on research will not only involve mentoring residents, but will directly influence patient care, and it should be compensated as such.
5. Research Funding
    a. Increase budget for research grants to encourage research inquiry at all levels of the healthcare team. A system for applying for research funding for projects will be needed to distribute the budget. This will allow more diversity of projects and more projects being run simultaneously and will decrease competition for scarce research funding.

4.7.8 Strengthen the quality and usefulness of SAO research

Objective: To ensure that SAO research is supported and improved to maximize usefulness to surgical system improvements and patient care.

Output Framework:

Expected Output	Indicator	Values	
		Baseline	Needs

Create research committee within SAO professional societies to define research priorities	Projects/year	None	Unknown
Integrate mandatory 2 month protected research proposal development time into residency program	Number residents taking research time/year	None	Unknown
Integrate formal research methodology training into curriculum for residents	Research courses/year	Unknown	NA

Strategies:

1. Define research priorities specific to surgery, anesthesia and obstetrics
    a. Encourage Anesthesia and OBGYN societies to form a research committee like the RSS research and educations committee, to define research priorities in their field. This will allow leaders in each field to identify areas that will add value to the literature in their respective field, and to identify and elevate projects that will directly improve patient care. It will also help to scale back projects that do not align with the priorities of the field or will not be applicable to quality improvement.
2. Strengthen research training and mentorship
    a. Integrate mandatory 2 months protected research proposal development time into residency program to encourage research skills at the resident level, and to create a pipeline of future faculty mentors. Residents should take ownership over a research project and see the project through completion by the end of their residency. They should be supported by a faculty mentor throughout the research project.
    b. Integrate formal research methodology training into curriculum for residents to transfer skills in research methodology and project creation and execution. This may include modules taught by Rwandan physicians, expatriate research visitors, or online curriculum designed for teaching research skills.

4.8 Finance

MoH is guided by several principles in the development and implementation of the Health Financing Policy: equity, risk sharing, solidarity, efficiency, evidence-based decision making, and results-based financing and management. There is also a call for transparency and accountability; and ownership, empowerment and participation, and partnerships. CBHI database showed that 85% CBHI coverage in 2011, while the formal sector schemes and private insurance account for 6% of the population, bringing the total health insurance coverage to 91%. Our assessment of district hospitals showed that most surgical patients have Mutuelle. Most hospitals (64%) reported that only 1-25% of surgical patients did not have insurance. Most hospitals (64%) reported only 1-25% of surgical patients are unable to pay for their bill, and when patients are unable to pay for a surgical bill the average cost is RWF 421,559, with a range of RWF 5000 to 10,000,000. Most hospitals (59.5) reported 1-25% of their annual budget to allocated to surgery and anaesthesia.

Objective: To decrease impoverishing and catastrophic expenditure for patients undergoing surgical care.

Output Framework:

Expected Output	Baseline	Needs
Numbers DHs with all bellwether procedures covered by CBHI	TBD	42 Hospitals
Costing index	None	42 Hospitals
Proportion of population protected against catastrophic expenditure	10% protected against catastrophic expenditure	0%

Strategies:

1. To increase the hospitals budget allocated to surgical, obstetric and anesthesia care
2. To ensure inclusion of all Bellwether procedures among procedures to be covered by CBHI.
3. To review of surgical costing index every two years to maintain appropriate costs of services in each region.
4. To track funding and expenditures for the NSOAP implementation and review annually through the HRTT.
5. To intensify resource mobilization in order to ensure the implementation and sustainability of the NSOAP

4.9 Governance

Effective leadership and governance are essential to the implementation of policies for advancing the implementation of the NSOAP. Involving of all stakeholders the private sector including will enrich strategies and provide a wider, more diversified lens to carefully examine the progress of the NSOAP implementation. Regular reporting and dissemination to providers at all levels will ensure efficacy, transparency, accountability, and equity in care delivery.

In addition, surgical system strengthening will result in overall development of Rwanda's health sector, through overall advancement of infrastructure, work force, service delivery, information management, and finance. This effort aligns well with the goals of VISION 2050, NST1, Health Sector Policy and the HSSP IV.

Strategies

1. MOH to oversee the overall NSOAP governance and accountability system (joint planning, budget allocation, implementation, monitoring and evaluation)
2. To have a NSC oversee and support the development of the NSOAP
3. To review NSOAP quarterly implementation progress reports for technical discussion guidance by the NSC
4. To have a full-time NSOAP coordinator appointed by the NSC for each domain and each implementation project

5. Costing

The NSOAP costing considered both fixed and variable costs dispatched into the five domains during the six years.
The total estimated cost for the NSOAP is $**69,735,071.93** as shown by the table. The Infrastructure and Human Resource are considered as investment cost with effect in the long term while the service delivery entails mostly medicines and materials relative to deliver surgery services communities or facilities levels.

Table. Cost per domain allocated to each year

Domain	Implementation Cost per Fiscal Year						Cost per domain (USD)	
	FY 2018/19	FY 2019/20	FY 2020/21	FY 2021/22	FY 2022/23	FY 2023/24		
Infrastructure	5,468,322.62	5,468,104.47	3,367,258.75	3,449,606.92	3,704,671.20	1,789,485.97	23,247,449.93	**33.34%**
Service Delivery	1,565,980.00	2,531,096.00	3,494,614.00	4,494,472.00	5,311,520.00	5,009,312.00	22,406,994.00	**32.13%**
Work Force	1,609,350.00	2,519,380.00	3,436,874.00	4,223,114.00	5,146,386.00	5,100,036.00	22,035,140.00	**31.60%**
Information Management and Technology	272,697.70	281,707.70	281,707.70	281,707.70	281,707.70	281,707.70	1,681,236.20	**2.41%**
Governance	46,935.00	43,885.00	43,885.00	43,885.00	43,885.00	43,885.00	266,360.00	**0.38%**
Finance	17,182.00	18,752.40	8,841.00	18,752.40	17,182.00	17,182.00	97,891.80	**0.14%**
Total	**8,980,467.32**	**10,862,925.57**	**10,633,180.45**	**12,511,538.02**	**14,505,351.90**	**12,241,608.67**	**69,735,071.93**	

INFRASTRUCTURE

Objective	Activities	Baseline	Need	Input	Unit Price	Total Cost (USD)	#	FY 2018-2019 Total Cost	#	FY 2019-2020 Total Cost	#	FY 2020-2021 Total Cost	#	FY 2021-2022 Total Cost	#	FY 2022-2023 Total Cost	#	FY 2023-2024 Total Cost
Improve infrastructure to meet minimum standards			27	room rehabilitation	74763.216	2018606.832	5	373816.08	5	373816.08	5	373816.08	5	373816.08	7	523342.512	0	
	Rehabilitate non-functional ORs at all hospitals, (# needed to be operational based on workforce)	27 non-functional, 91 functional	27	OR assessment personel (data	35.1	947.7	5	175.5	5	175.5	5	175.5	5	175.5	7	245.7		
			27	transport	91.6	2473.2	5	458	5	458	5	458	5	458	7	641.2		
	Improve existing functional OR's at all District and Referral Hospitals to meet	91 functioning DH	91	operating room	37381.608	3401726.328	18	672868.944	18	672868.944	18	672868.944	18	672868.944	19	710250.552	0	
	3 Referral Hospitals (3)	18	18	operating room	37381.608	672868.944	3	112144.824	3	112144.824	4	149526.432	4	149526.432	4	149526.432		
	Yearly Maintenance of all ORs to maintain minimum standards		136		3738.1608	508389.8688	136	508389.8688	136	508389.8688	136	508389.8688	136	508389.8688	136	508389.8688	136	508389.8688
	Ensure adequate number of beds / hospital	1533 surgical beds	0	surgical bed	4,140.56	0.00												
			1533	surgical bed upgrades	1,242.10	1,904,139.30	153	190041.3	153	190041.3	153	190041.3	153	190041.3	153	190041.3	153	190041.3
			1533	yearly maintenance	50.00	76,650.00	1533	76650	1533	76650	1533	76650	1533	76650	1533	76650	1533	76650
	Provide maintenance to repair non-functional ventilators / integrate with	36 non-functioning	36	Anesthesia machine	3,825.84	137,730.24	18	68865.12	18	68865.12	0	0	0	0	0	0		
								0		0		0		0		0		
	All hospitals to have 1 anesthesia machine per functioning operating theatre	70 functional anesthesia machine	48	Anesthesia machine	12,752.80	612,134.40	16	0	16	0	16	0	0	0	0	0		
	All hospitals to have at 1 additional back-up Anesthesia machine	0 backups	42	Anesthesia machine	12,752.80	535,617.60	0	0	0	0	14	178539.2 0	14	178539.2 0	14	178539.2		
	surgical supplies on ward	unknown	42	wards	11,507.40	483,310.80	21	241655.4	21	241655.4								
	Harmonize acquisition of good quality						1	0										
			3	meeting to decide	150.00	450.00	1	150										
			1	location	50.00	50.00	1	50										
	Develop a biomedical engineering plan for each province, 1 biomedical engineers per Hospital		2	meeting to decide	150.00	300.00	1	150										
			1	location	50.00	50.00	1	50										
		3	42	biomedical engineer	4,598.40	193,132.80	42	193132.8	42	193132.8	42	193132.8	42	193132.8	42	193132.8	42	193132.8
	1 sterilzation unit/ hospital	20	22	sterillization unit	79,748.00	1,754,456.00	11	877228	11	877228								
	1 autoclave per OR, and 1 per surgical ward, and 2 instrument washers per hospital	unknown # of instrument washers	42	instrument washer	31,500.00	1,323,000.00	21	661500	21	661500								
			42	drums and instrument box for	3,100.00	130,200.00	21	65100	21	65100								
	Improve and maintain laundry services at every district hospital and referral hospital		42	laundry equipment	27,044.00	1,135,848.00	21	567924	21	567924								
	1.5 recovery beds per functioning operating theatre	65 PACU beds	112	cost of PACU bed	4,140.56	463,742.72	22	91092.32	22	91092.32	22	91092.32	22	91092.32	24	99373.44		
	Staff for PACU, PH: 5 nurses staffed (Am or PM shifts), DH: 3 nurses		131	PACU nurse	4,598.00	602,338.00	26	119548	52	239096	78	358644	104	478192	131	602338	131	602338
	All recovery beds to have full monitoring and oxygen supply	65	112	mural vital signs monitor	8,053.00	901,936.00	22	177166	22	177166	22		22	177166	24	193272		
	All Provencial hospitals to have full ICU services with a minimum of 4 ICU beds											177166						
		2 beds at Kibungo	14	cost of ICU room	32,268.92	451,764.88	4	129075.68	4	129075.68	4	129075.68	2	64537.84				
			2	ICU room upgrades (at Kibungo)	9,680.68	19,361.35	2	19361.352		0		0		0				

INFRASTRUCTURE

Objective	Activities	Baseline	Need	Input	Unit Price	Total Cost (USD)	#	FY 2018-2019 Total Cost	#	FY 2019-2020 Total Cost	#	FY 2020-2021 Total Cost	#	FY 2021-2022 Total Cost	#	FY 2022-2023 Total Cost	#	FY 2023-2024 Total Cost
Improve infrastructure to meet minimum standards			4	ICU unit	56,770.23	227,080.92	1	56770.23	1	56770.23	1	56770.23	1	56770.23				
			16	ICU room maintenance	968.00	15,488.00	16	15488	16	15488	16	15488	16	15488	16	15488	16	15488
	1:1 nursing in ICU	unknown	32	12 hr nurse salary	4,598.00	147,136.00	6	27588	12	55176	18	82764	24	110352	32	147136	32	147136
	Define ICU-level care		2	meeting to decide	150.00	150.00	1	150		0		0		0				
			1	location	50.00	50.00	1	50		0		0		0				
Increase utilization of current radiology services	4 Ultrasound in all district hospitals	30 Hospital with u/s access (quantity unknown)	80	ultrasound machine	3,296.90	263,752.00	16	52750.4	16	52750.4	16	52750.4	16	52750.4	18	59344.2		
	C-arm in all referral hospitals	No C-arm at all 4 PH	8	Fluoroscopy machine	72,381.40	579,051.20	2	144762.8	2	0		0						
	Training course for SAO graduating residents on use of ultrasound, added into curriculum for residents	0	5	1 course per year, 5 days	600.00	3,000.00	1	3000	1	3000	1	3000	1	3000	1	300		
Improve laboratory and ancillary services to meet minimum	Encourage MOH to develop functioning pathology department at all referral hospitals	1 at Butaro	3	salary of a pathologist	18,170.00	54,510.00	1	18170	2	36340	3	54510	3	54510	3	54510	3	54510
	Develop a pathology referral pathway for escalating specimens and receiving reports (through telemedicine)		2	meeting to decide	150.00	300.00	1	150		0		0						
			1	location	50.00	50.00	1	50		0		0						
Expand access to blood and blood products	Develop blood bank reserve minimums - define minimum	unknown	2	meeting to decide	150.00	300.00	1	150	1	150		0						
			1	location	50.00	50.00	1	50	1	50		0						
	Ensure active/reliable blood delivery system	Blood available within 2 hrs at all sites but 3	2	meeting to decide	150.00	300.00	1	150		0	1	150						
			1	location	50.00	50.00	1	50		0	1	50						
	Establish guidelines for appropriate use of blood supply and blood products		2	meeting to decide	150.00	300.00	1	150		0	1	150						
			1	location	50.00	50.00	1	50		0	1	50						
	Train all SAO providers on the appropriate use of blood and blood products		3	1 course per year, for 3 days for SAO providers	600.00	1,800.00	1	1800	1	1800	1	1800	1	1800	1	1800	1	1800
Harmonize supply chain	Project management taskforce to develop a centralized system		2	meeting to decide	150.00	300.00	1	150			1	150						
			1	location	50.00	50.00	1	50			1	50						
	Implement guidelines for medicine and medical supply donations							0										
			2	meeting to decide	150.00	300.00		0					1	300	1	300		
			1	location	50.00	50.00		0					1	50	1	50		
			2	meeting to decide	150.00	300.00	1	150	1	150								
			1	location	50.00	50.00	1	50	1	50								
						23,247,449.93		**5,468,322.62**		**5,468,104.47**		**3,367,258.75**		**3,449,606.91**		**3,704,671.20**		**1,789,485.97**
																	total	**23,247,449.93**

SERVICE DELIVERY

Objective	Activities	Baseline	Need	Input	Unit Price	Total Cost (USD)	#	FY 2018-2019 Total Cost	#	FY 2019-2020 Total Cost	#	FY 2020-2021 Total Cost	#	FY 2021-2022 Total Cost	#	FY 2022-2023 Total Cost	#	FY 2023-2024 Total Cost
Prioritize reditribution of SAO physicians and providers to DHs	Referral hospitals: 2 surgeons, 1 anaesthesiologist, 2 OBGYNs, 2 ortho surgeons	42 surgeons, 13 anaesthesiologists, 14 obgyn	none															
	PH and DH: 1 surgeon, 1 anaesthesiologist, 1 OBGYN, 1 OPHT	9 surgeons	33	# of providers	18,170.00	599,610.00	7	127190	14	254380	21	381570	28	508760	33	599610	33	599610
		0 Opht	42	# of providers	18,170.00	763,140.00	7	127190	14	254380	21	381570	32	581440	42	763140	42	763140
		2 anesthesiologists	40	# of providers	18,170.00	726,800.00	8	145360	16	290720	24	436080	30	545100	40	726800	40	726800
		12 obstetricians	30	# of providers	18,170.00	545,100.00	7	127190	14	254380	21	381570	28	508760	30	545100	30	545100
	PH to have 1 orthopedic surgeon	0	4	# of providers	18,170.00	72,680.00	1	18170	2	36340	3	54510	4	72680	4	72680	4	72680
	Referral Hospital: 48 anesthesia techs	75	69	# of providers	4,598.00	317,262.00	15	68970	30	137940	45	206910	60	275880	69	317262	69	317262
	DH: 6 anesthesia techs	157	71	# of providers	4,598.00	326,458.00	15	68970	30	137940	45	206910	60	275880	71	326458	71	326458
	PH: 10 anesthesia techs	16	24	# of providers	4,598.00	110,352.00	5	22990	10	45980	15	68970	20	91960	24	110352	24	110352
	PH: to have 12 surgical nurses (both AM+ PM), DH: 10 nurses																	
		257 full-time surgical nurses	91	nurses	4,598.00	418,418.00	20	91960	40	183920	60	275880	80	367840	91	418418	91	418418
	In PHs, 1 ICU nurse per bed	Already costed in infrastructure																0
	2 operating nurse per operating theatre	unknown	182	nurses	4,598.00	836,836.00	37	170126	74	340252	110	505780	146	671308	182	836836	182	836836
Increase volume of outreach surgery	12 times per year	4 outreaches/ year	8	outreaches	37,776.00	302,208.00	8	302208	8	302208	8	302208	8	302208	8	302208		0
	6 outreaches/year	5/ year	1	outreaches	37,776.00	37,776.00	1	37776	1	37776	1	37776	1	37776	1	37776	1	37776
	3 outreaches/year	0 outreaches	5	outreaches	37,776.00	188,880.00	5	188880	5	188880	5	188880	5	188880	5	188880	5	188880
Formalize mentorship between tertiary hospital and DH	Develop a statregic plan for mentorship		2	meeting to decide	150.00	300.00	1	300										
			1	location	50.00	50.00	1	50										
Standardize offered procedures at DH level	Ensure list of surgical procedures to be performed at DH and at PH		2	meeting to decide	150.00	300.00	1	300										
			1	location	50.00	50.00	1	50										
	Establish workforce and infrastructure needs to provide the recommended services		2	meeting to decide	150.00	300.00	1	300										
			1	location	50.00	50.00	1	50										
Improve quality of surgical care	Reinforce Trauma training course, offered 2x/year for all providers (nurses, EMT, SAO providers)	0	2	trauma course per year	3,000.00	6,000.00	2	6000	2	6000	2	6000	2	6000	2	6000	2	6000
	Reinforce Anesthesia training courses, offered to anesthesiologists and anesthesia tech (FCCS, SAFE, APLS, ACLS, VAST,	0	6	anesthesia course per year	3,000.00	18,000.00	6	18000	6	18000	6	18000	6	18000	6	18000	6	18000
	Reinforce REST Courses provided to GPs/Year	11	1	REST course	3,000.00	3,000.00	12	36000	12	36000	12	36000	12	36000	12	36000	12	36000
	Reinforce Obgyn ALSO training course, offered 3x/ year for Obgyn and Family Practioners	3	5	ALSO course per year	3,000.00	15,000.00	2	6000	2	6000	2	6000	2	6000	2	6000	2	6000
Improve referral system	Each province to have a designated referral pathway for surgery including which surgeries should be referred where and when	(Baseline HAT Figure 3d)	4	meeting to decide	150.00	600.00	1	600										
			1	location	50.00	50.00	1	50										
	Create feedback mechanism for tertiary hospitals to DH on a quarterly basis regarding referrals received		4	meeting to decide	150.00	600.00	1	600										
			1	location	50.00	50.00	1	50										
	Develop national protocols for triage of common urgent conditions to facilitate		4	meeting to decide	150.00	600.00	1	600										
			1	location	50.00	50.00	1	50										
								1,565,980.00		**2,531,096.00**		**3,494,614.00**		**4,494,472.00**		**5,311,520.00**		**5,009,312.00**
																total		**22,406,994.00**

WORKFORCE

Objective	Activities	Baseline	Need	Input	Unit Price	Total Cost (USD)	#	FY 2018-2019 Total Cost	#	FY 2019-2020 Total Cost	#	FY 2020-2021 Total Cost	#	FY 2021-2022 Total Cost	#	FY 2022-2023 Total Cost	#	FY 2023-2024 Total Cost
Train specialist physician providers	Increase anaesthesia residents at University of Rwanda to: 15	10 residents	5	resident	59,713.00	298,565.00	1	59713	2	119426	3	179139	4	238852	5	298565	5	298565
	Increase general surgery residents at University of Rwanda to: 20	6 residents	14	resident	59,713.00	835,982.00	2	119426	4	238852	6	358278	9	537417	14	835982	14	835982
	Increase Ob-gyn residents trained at University of Rwanda to: 30	20 residents	18	resident	59,713.00	1,074,834.00	4	238852	8	477704	10	597130	14	835982	18	1074834	18	1074834
	Increase OBGYN residents trained through ECSACOGS: 8	0 residents	8	resident	56,329.00	450,632.00	2	112658	4	225316	6	337974	8	450632	8	450632	8	450632
	Increase general surgery residents trained through COSECSA to: 15	10 residents	5	resident	56,329.00	281,645.00	1	56329	2	112658	3	168987	4	225316	5	281645	5	281645
	Increase ENT residents, University of	1 resident	2	resident	59,713.00	119,426.00					1	59713	2	119426	2	119426	2	119426
	Increase ophthalmology residents, University of Rwanda: 6	4 residents	2	resident	59,713.00	119,426.00	1	59713	1	59713	1	59713	2	119426	2	119426	2	119426
	Increase urology residents, University of	2 resident	2	resident	74,641.00	149,282.00	2	149282	2	149282	2	149282	2	149282	2	149282	2	149282
	Increase NSG residents, University of	1 resident	3	resident	89,571.00	268,713.00	3	268713	3	268713	3	268713	3	268713	3	268713	3	268713
	Increase Ortho residents, University of	5 residents	0	resident	74,641.00	0.00	0	0	0	0		0	0	0	0	0	0	0
	Increase Oral-dental residents, University of Rwanda: 9	0 residents	9	resident	59,713.00	537,417.00	2		4	238852	6	358278	8	477704	9	537417	9	537417
Improve SAO skills and knowledge	Establish CME guidelines and requirements		2	meeting to decide	150.00	300.00	1	300										
	Mandate providers to log CME		1	location	50.00	50.00	1	50										
	Each professional society to develop a CME curriculum for their providers.		6	meeting to decide	150.00	900.00	1	900										
			3	location	50.00	150.00	1	50										
	Gain access to CME online resources		1	CME coordinator	6,827.00	6,827.00	1	6827	1	6827	1	6827	1	6827	1	6827	1	6827
			3	online subscriptions	200.00	600.00	1	200	2	400	3	600	3	600	3	600	3	600
Extend training to GPs to perform Bellewether procedures	Create a taskforce over GP certification and credentialing.		2	meeting to decide	150.00	300.00	1	300	1									
			1	location	50.00	50.00	1	50	1									
Train interns to perform surgery and	Require that all interns do the Basic Surgical Skills course during their internship year		4	courses	3,540.00	14,160.00	4	14160	4	14160	4	14160	4	14160	4	14160	4	14160
Increase sustained distribution of SAO providers to rural settings, and decrease attrition		unknown	130	incentivized bonus/ physician to practice rurally each year	1,500.00	195,000.00	130	195000	130	195000	130	195000	130	195000	130	195000	130	195000
	Provide financial incentives for SAO Providers who serve in certain areas for so many years (5, 10, 15, 20) as well as career development opportunities (CME,promotions despite being rurally based, etc)		63	bonus/ each year after 5 years	2,000.00	126,000.00									63	126000		
				bonus/ each year after 10	3,000.00													
				bonus/ each year after 15 years	4,000.00													
	Provide additional services for familes serving in rural areas (education for children,housing, reilable internet, electricity)		130	family bonus to practice rurally	1,800.00	234,000.00	130	234000	130	234000	130	234000	130	234000	130	234000	130	234000
	Increase the number of rural rotations for SAO residents, 12 residents/hospital, increase to 4 hospitals	4 residents	48	cost of 1 resident to rotate	600.00	28,800.00	10	6000	20	12000	30	18000	40	24000	48	28800	48	28800
	Develop minimum certification requirements for active retirees, increase to 10	5 SAO providers	2	meeting to decide	150.00	300.00			1	300								
			1	location	50.00	50.00			1	50								
	Develop an attractive loan package to graduating surgical residents similar to others offered in the region through	financial package offered to graduating SAO providers	2	meeting to decide	150.00	300.00					1	300						
			1	location	50.00	50.00					1	50						

WORKFORCE

Objective	Activities	Baseline	Need	Input	Unit Price	Total Cost (USD)	#	FY 2018-2019 Total Cost	#	FY 2019-2020 Total Cost	#	FY 2020-2021 Total Cost	#	FY 2021-2022 Total Cost	#	FY 2022-2023 Total Cost	#	FY 2023-2024 Total Cost
	Expand credit and saving scheme (through Mutuelle AID group) so that physicians can get access to affordable loans at PH and DH, increase 20 residents	10 residents	10 residents															
			2	meeting to decide	150.00	300.00							1	300				
			1	location	50.00	50.00							1	50				
Training of anaesthesia technicians	Increase number of anesthesia techs trained to 100/year		90	training of a AT (total duration)	5,310.00	477,900.00	15	79650	30	159300	45	238950	60	318600	75	398250	90	477900
	Develop a continued medical education program and mentorship program with the anesthelogist		1	CME coordinator for anesthesia	6,827.00	6,827.00	1	6827	1	6827	1	6827	1	6827	1	6827	1	6827
Expand the opportunities for subspecialist training more subspecialists	Decide what specialties are a priority to train (pediatric surgery, minimally invasive, surg		2	meeting to decide	150.00	300.00	1	300										
			1	location	50.00	50.00		50										
	Write curriculum for Rwanda-based subspecialist fellowship training programs decided upon (3 new programs long term	0	1	surgical subspecialty traning	61,651.00	61,651.00					3	184953						
								1,609,350.00		**2,519,380.00**		**3,436,874.00**		**4,223,114.00**		**5,146,386.00**		**5,100,036.00**
																total		**22,035,140.00**

INFORMATION MANAGEMENT

Objective	Activities	Baseline	Need	Input	Unit Price	Total Cost (USD)	#	FY 2018-2019 Total Cost	#	FY 2019-2020 Total Cost	#	FY 2020-2021 Total Cost	#	FY 2021-2022 Total Cost	#	FY 2022-2023 Total Cost	#	FY 2023-2024 Total Cost
Integrate surgical indicators into existing data collection to inform decision making and policies (Information Management)	Focus on development of a registry for indicators that will be reported quarterly																	
			4	meeting to decide	150.00	600.00	4	600	4	600	4	600	4	600	4	600	4	600
			1	location	50.00	50.00	4	200	4	200	4	200	4	200	4	200	4	200
	Same taskforce will compile a report that should be presented to the steering	0	1				0		0		0		0		0			
Integrate NSOAP data collection with existing data surveillance systems	Integrate tracking of surgical volume by type of procedure performed into HMIS																	
			4	meeting to decide	150.00	600.00	1	600										
			1	location	50.00	50.00	1	50										
	Annual audit of data collection to evaluate relevance and use at local facilities																	
			1	M&E Coordinator	6,827.00	6,827.00	1	6827	1	6827	1	6827	1	6827	1	6827	1	6827
	- Trauma registry (need to decide indicators) - Cancer registry - Case logs	unknown	42 hospitals															
			4	meeting to decide upon indicators	150.00	600.00	1	600										
			1	location	50.00	50.00	1	50										
			42	trauma registry data collector per District	3,569.60	149,923.20	42	149923.2	42	149923.2	42	149923.2	42	149923.2	42	149923.2	42	149923.2
			5	database managers 1 per province	6,682.50	33,412.50	5	33412.5	5	33412.5	5	33412.5	5	33412.5	5	33412.5	5	33412.5
			3	Registry Coordinator	6,827.00	20,481.00	3	20481	3	20481	3	20481	3	20481	3	20481	3	20481
Quality Improvement	informational booklets and reports		1	dissemination	100.00	100.00	1	100	1	100	1	100	1	100	1	100	1	100
	Costing index for surgical services			M&E Coordinator	Costed above													
	bi-annual meeting of representative surgeon or GP from each DH to discuss QI issues	none.	84	meeting to decide	150.00	12,600.00	2	300	2	300	2	300	2	300	2	300	2	300
			2	location	50.00	100.00	2	100	2	100	2	100	2	100	2	100	2	100
HMIS maintenance	IT Taskforce to create a system with a requirement of data collectors, analyzers, HMIS data cleaning, dependent on the level	38 hospitals with personnel maintaining records	4	IT personnel	5,680.00	22,720.00	2	11360	4	22720	4	22720	4	22720	4	22720	4	22720
Build research capacity around surgical system	Designate 4 DHs to be research centers. -residents or surgeons to conduct research																	
			2	statisician	6,608.50	13,217.00	2	13217	2	13217	2	13217	2	13217	2	13217	2	13217
			1	research coordinator	6,827.00	6,827.00	1	6827	1	6827	1	6827	1	6827	1	6827	1	6827
	Increase budget for research grants		1	subscription to research resource (ie pubmed)	2,000.00	2,000.00	1	2000	1	2000	1	2000	1	2000	1	2000	1	2000
			5	trainee research	1,000.00	5,000.00	5	5000	5	5000	5	5000	5	5000	5	5000	5	5000
			5	trainee travel grants	1,000.00	5,000.00	5	5000	5	5000	5	5000	5	5000	5	5000	5	5000
			5	faculty research	2,000.00	10,000.00	5	10000	5	10000	5	10000	5	10000	5	10000	5	10000
			5	faculty travel grants	1,000.00	5,000.00	5	5000	5	5000	5	5000	5	5000	5	5000	5	5000
Strengthen the quality and usefulness of SAO research	Create research committee within SAO professional societies to define research priorities		6	meeting to decide	150.00	900.00	1	900										
			3	location	50.00	150.00	1	150										
								272,697.70		**281,707.70**		**281,707.70**		**281,707.70**		**281,707.70**		**281,707.70**
																TOTAL		**1,681,236.20**

GOVERNANCE

Objective	Activities	Baseline	Need	Input	Unit Price	Total Cost (USD)	#	FY 2018-2019 Total Cost	#	FY 2019-2020 Total Cost	#	FY 2020-2021 Total Cost	#	FY 2021-2022 Total Cost	#	FY 2022-2023 Total Cost	#	FY 2023-2024 Total Cost
Dissimenation of NSOAP	Distribute NSOAP to all DHs Publish NSOAP to MOH website Have NSOAP ceremony		42	printing of plan			42											
Establish NSOAP accountability at all levels of care	Provincial teams to conduct information sessions for district and facility teams on NSOAP plan and projects Professional socieites to alert members		42	meeting to discuss	150.00	6,300.00	1	6300	1	6300	1	6300	1	6300	1	6300	1	6300
			5	location	50.00	250.00	5	250	5	250	5	250	5	250	5	250	5	250
	Form a steering committee to appoint a full time NSOAP coordinator for each domain and each project		2	meeting to decide	150.00	300.00	1	300										
			1	location	50.00	50.00	1	50										
			5	NSOAP coordinators	6,827.00	34,135.00	5	34135	5	34135	5	34135	5	34135	5	34135	5	34135
Produce NSOAP progress reports	Progress reports distributed at quarterly reporting meetings to all domain	none.	4	dissemination	100.00	400.00	12	1200	12	1200	12	1200	12	1200	12	1200	12	1200
	Bi-annual steering committee meeting to review reports compiled by domain coordinators, and re-prioritize new projects	none.																
			10	2 meetings	150.00	1,500.00	2	3000	2	300	2	300	2	300	2	300	2	300
			2	location	50.00	100.00	2	100	2	100	2	100	2	100	2	100	2	100
Professional societies to commit to support implementation as a united front	Steering committee meets to inform and direct implementation Communicate steering committee progress to individual societies																	
			10	2 meetings	150.00	1,500.00	1	1500	1	1500	1	1500	1	1500	1	1500	1	1500
			2	location	50.00	100.00	1	100	1	100	1	100	1	100	1	100	1	100
								46,935.00		**43,885.00**		**43,885.00**		**43,885.00**		**43,885.00**		**43,885.00**
																	TOTAL	**266,360.00**

FINANCE																			
Objective	Activities	Baseline	Need	Input	Unit Price	Total Cost (USD)	#	FY 2018-2019 Total Cost	#	FY 2019-2020 Total Cost	#	FY 2020-2021 Total Cost	#	FY 2021-2022 Total Cost	#	FY 2022-2023 Total Cost	#	FY 2023-2024 Total Cost
Patient Costs: Decrease catastrophic and impoverishing	Ensure inclusion of all bellewether procedures and designated surgical packages to be covered by universal health		1	consultant fee for finance advisor	7,841.00	7,841.00	1	7841										
			3	meeting to expand surgical packages	150.00	450.00	1	450										
			1	location	50.00	50.00	1	50										
	Reinforce established surgical index pricing for out of pocket cost for patients at each mutuelle level		1	consultant fee for financial advisor	7,841.00	7,841.00			1	7841			1	7841	1	7841	1	7841
			3	meeting to establish surgical index	150.00	450.00			1	450			1	450	1	450	1	450
			1	location	50.00	50.00			1	50			1	50	1	50	1	50
	Conduct survey every 3 years to establish effectiveness of Mutuelle coverage for surgical, anesthesia, obstetric care			every 3 years, survey of patients to assess														
			12	data collector	35.10	421.20			12	421.2			12	421.2				
			12	transportation	91.60	1,099.20			12	1099.2			12	1099.2				
			1	supplies	50.00	50.00			1	50			1	50				
	MOH to review surgical costing index each year, to maintain appropriate costs of services in regions		1	financial advisor consultant for	7,841.00	7,841.00	1	7,841.00	1	7,841.00	1	7,841.00	1	7,841.00	1	7,841.00	1	7,841.00
			3	surgical index review yearly	150.00	450.00	1	450.00	1	450.00	1	450.00	1	450.00	1	450.00	1	450.00
			1	location	50.00	50.00	1	50.00	1	50.00	1	50.00	1	50.00	1	50.00	1	50.00
MOH budget	Annually review the budget allocated to surgery, anethesia and obstetrics, increase appropriately at the national provincial and		3	meeting to decide	150.00	450.00	1	450.00	1	450.00	1	450.00	1	450.00	1	450.00	1	450.00
			1	location	50.00	50.00	1	50.00	1	50.00	1	50.00	1	50.00	1	50.00	1	50.00
								17,182.00		**18,752.40**		**8,841.00**		**18,752.40**		**17,182.00**		**17,182.00**
																TOTAL		**97,891.80**

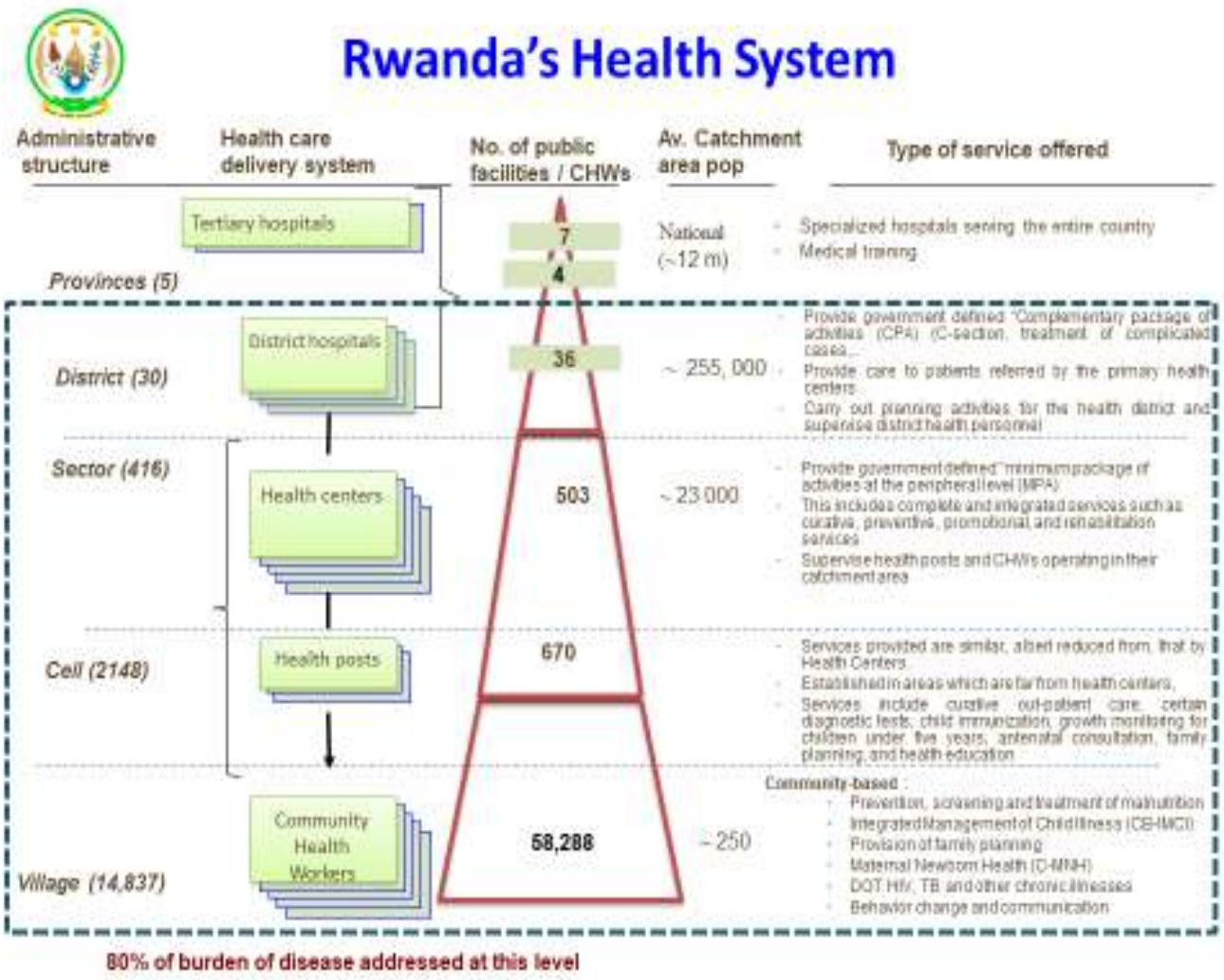
6. Annexes

6.1 NSOAP Logical Framework: Indicators & Targets

Indicators Outcome / Output	Baseline Indicator Value (2016/17)	Indicator Targets						Means of Verification
		Target 2018/19	Target 2019/20	Target 2020/21	Target 2021/22	Target 2022/23	Target 2023/24	
LCoGS outcome indicators								
Access to timely essential surgery	100	100	100	100	100	100	100	Annual Statistical Booklet
Surgical, anaesthesia and Obstetrics-Gynaecology (SAO) provider density per 100,000 population	0.8						20	Annual Statistical Booklet
Surgical Volume per 100,000 population	786						5000	Annual Statistical Booklet
Perioperative Mortality Rate (POMR) Tracking rate	76.2	80	100	100	100	100	100	Annual Statistical Booklet
Perioperative mortality rate	3.1	-	2.5	-	-	-	2	
Risk of impoverishing expenditure	NA	-	0%	-	-	-	0%	Survey
Risk of catastrophic expenditure	10%	-	0%	-	-	-	0%	Survey
Infrastructure	**Output Indicators**							
Number of oxygen plants in referral provincial and district hospitals	3		5				10	Annual Statistical Booklet
Number of functional operating theatres to meet minimum requirements as defined by Services Packages	91		104				118	Annual Statistical Booklet
Number of functional ICU beds with minimum requirements as defined by WHO and WFSA								Annual Statistical Booklet
Number of districts hospitals with at least two GA machines	32		38				38	Annual Statistical Booklet
Number of referral and provincial hospitals with at least one C-arm	1		3				7	
Service delivery								
Cataract Surgical Rate (number of cataract surgeries per million population per year)	400		700				1,000	Annual Statistical Booklet

Number of open fracture reduction done at provincial and district level								
Workforce								
Number Hospitals accredited to be regional COSECSA training sites	4		11				19	MOH Annual report
Number Hospitals accredited to be regional COECSA training sites	1		2				3	MOH Annual report
Number Hospitals accredited to be regional ECSACOGS training sites	NA		8				15	MOH Annual report
Number of graduating SAO providers per year								MOH Annual report
Number of GPs credentialed to perform Bellwether procedures per year								RMDC Annual report

6.2 Organizational chart of Rwanda Health System



6.3 Map of Health Facilities in Rwanda

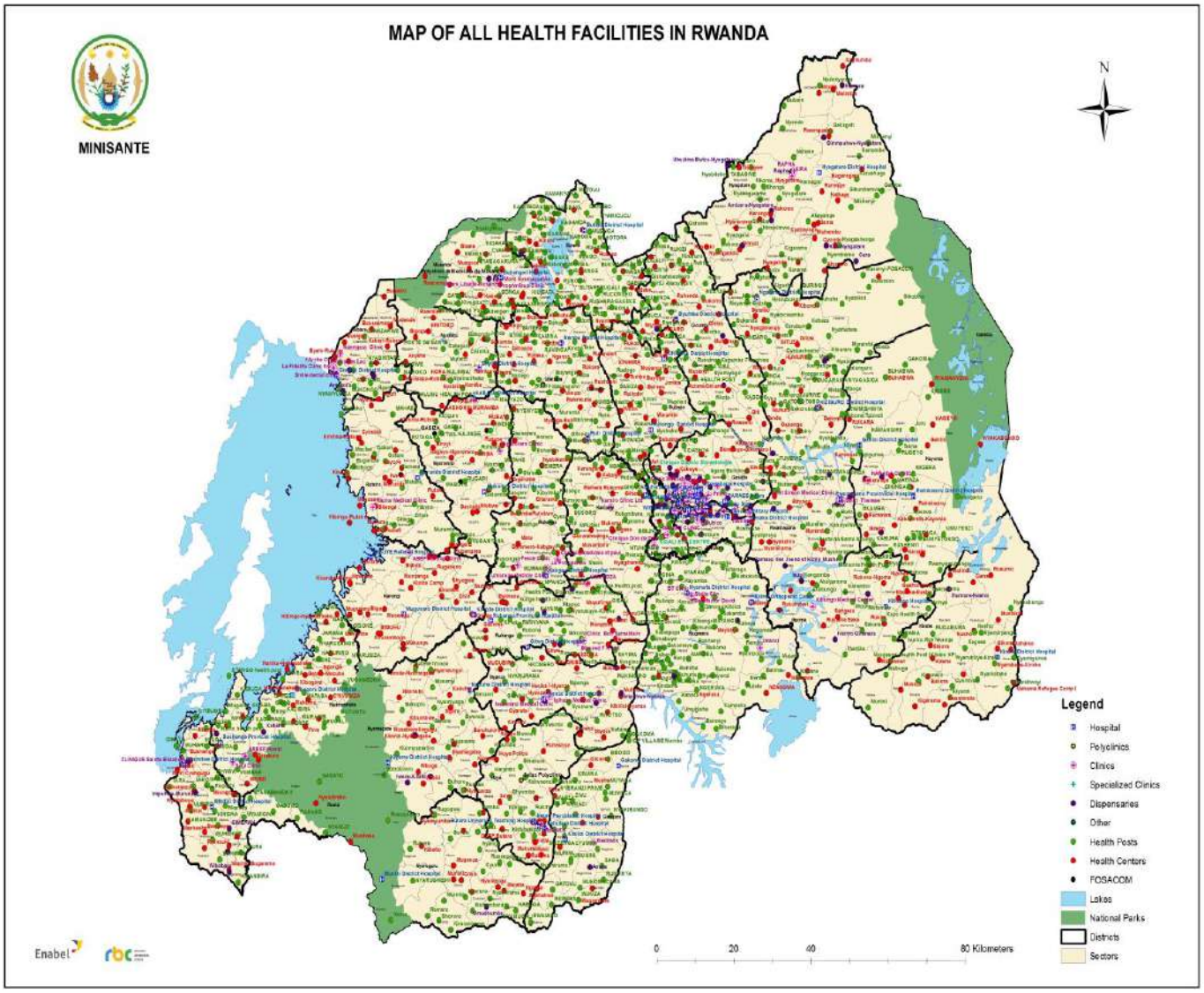


Figure 1:Source: Author, Rwanda MFL Assignment, 2018

6.4. Tables and Figures

7. Authors and Acknowledgements

Steering Committee for the NSOAP

Names	Position	Organization
Dr Zuberi MUVUNYI	Director General of Clinical and Public Health Services **(Chair of NSC)**	MOH
Dr. Parfait UWALIRAYE	Director General of Planning, Health Financing and Information System	MOH
Dr. Theophile DUSHIME	Division Manager of Emergency Services	MOH
Pascal BIRINDABAGABO	Health Insurance Policies Expert	MOH
Andrew MUHIRE	Sector M&E and Report Specialist	MOH
Denyse INGERI	District Planning and M&E Officer	MOH
Dr. Martin NYUNDO	President	RSS
Dr. Emile RWAMASIRABO	Former-President	RSS
Dr. Egide ABAJUHE	Secretary General	RSS
Dr John NKURIKIYE	Chairman	ROS
Dr. Eugene NGOGA	Chairman	RSOG
Dr Paulin BANGUTI	Chairman	RSA
Dr. Jeanne UWAMBAZIMANA	Former President	RSA
Dr. Philbert MUHIRE	Director General	Rwamagana PH
Dr. William NAMANYA	Director General	Kibungo RH
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8. References

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REPUBLIC OF RWANDA