Anesthesia in Rwanda: directions for the future

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BACKGROUND

Six years ago a partnership was established between the National University of Rwanda, the Canadian Anesthesiologists’ Society International Education Foundation (CASIEF), and the American Society of Anesthesiologists Global Humanitarian Outreach (ASAGHO), for anesthesia residency training in Rwanda. The program has developed well, with the first two residents graduating in February 2011 and two more finishing in December 2011. As of January 2012, there are eleven Rwandan anesthesia residents in training. Although the program is widely perceived as successful, it is only part of a broad vision of establishing excellent anesthesia and surgical services in Rwanda. The CHAI/USAID program aims to work in concert with the Rwandan anesthesia providers and the well-established CASIEF/ASAGHO program to continue to build towards a self-sufficient peri-operative system in Rwanda.

Well-developed peri-operative care requires strength in surgery, anesthesia, nursing, operating room organization, and management of equipment and supplies. This document seeks to describe the current state of anesthesia practice in Rwanda and to make recommendations for improvement. However, first-rate anesthesia care does not happen in isolation. Challenges for surgical and nursing care are not addressed here. Coordination of all aspects of the peri-operative team is necessary to provide excellent care for surgical patients.

The authors’ comments come from their own observations working in Rwandan tertiary care and district hospitals and from reports filed by CASIEF/ASAGHO volunteers after each month of teaching. Therefore, this report of current strengths and limitations in anesthesia practice comes from multiple sources, both Rwandan and North American. This material has been previously submitted to the Strengthening Rwandan Surgery Advising Group (SRSAG) as part of a coordinated strategy to improve conditions for surgical patients in Rwanda. It is our hope this report will help guide the development of anesthesia practice in Rwanda in the years to come.
SUMMARY OF RECOMMENDATIONS

Human Resources
1. There must be a multifaceted approach to address the shortage of anesthesiologists in Rwanda, including attention to: education, lifestyle, workload, incentives, and competitive financial rewards.
2. Anesthesiology needs to become a more inviting specialty to medical students.
3. Consultant anesthesiologists should be supported in achieving excellence as teachers and should be given opportunities to pursue training in subspecialty anesthesia.

Education
1. Partnership between the Rwandan Society of Anesthesia, the Rwanda Association of Anesthesia, and the National University of Rwanda needs to be further developed with a goal of comprehensive education for anesthesia technicians.
2. A strong program of refresher courses, covering common anesthetic problems, should be offered Anesthesia technicians working in both district hospitals and urban centres.
3. The anesthesia residency program needs to be strengthened by continuing to refine the curriculum, building a strong cadre of local teachers, and by addressing the obstacles to safe operating room practice.
4. There is a need for designated space and staff support for a low-fidelity instructor-driven simulation centre.
5. The Rwandan Society of Anesthesia and the Rwanda Association of Anesthesia should be active in uniting anesthesia providers in diverse locations, setting standards of practice, and encouraging continuing education through an annual conference.
6. Ethically sound, collaborative research projects should be encouraged when their main beneficiaries of such studies are the Rwandans.

Infrastructure
a) Equipment, monitors, and drugs
1. Rwandan operating theatres should strive to adhere to essential standards for drugs and equipment for safe practice of anesthesia as outlined by the World Federation of Societies of Anesthesiologists.
2. Essential medications for anesthesia, as specified by the World Health Organization, should be available.
3. Each hospital should designate a person to be responsible for organization of anesthesia equipment.
4. There is a critical need for biomedical technicians who can handle equipment maintenance and repair.
b) Peri-operative services
   1. Leadership in anesthesia, nursing, and surgery is needed for smooth communication to coordinate operating room activities.
   2. Dedicated staff with appropriate education and protocols is needed in recovery room.
   3. Team coordination between anesthesia, obstetrics, and nursing is needed to develop protocols for safer maternal care.
   4. Pain management can be improved by education, policy development, and improving access to essential medications.
CURRENT STATE OF ANESTHESIA IN RWANDA AND A VISION FOR THE FUTURE

This section examines three aspects of anesthesia practice that are critical to success: human resources; education; and infrastructure. Infrastructure is the entire system that supports anesthesia and surgical practice, including: equipment, monitors, drugs, and operating room organization. For each of these attributes we describe what we believe to be the ideal goal, the current situation, and recommendations for change. Final recommendations are summarized.

This document offers a glimpse into the present state of anesthesia in Rwanda with directions for the future. However, practice is dynamic and ever changing; it is important to remember that goals will continue to evolve. The well-established, respectful partnerships that are currently working so successfully in Rwanda provide great support to fulfillment of this vision.

1. HUMAN RESOURCES

Ideal Goals:
- Coordinated anesthesia care teams (made up of anesthesiologists and anesthesia technicians) are found in both tertiary care and district hospitals with well-trained anesthesiologists providing leadership, mentoring, and education for anesthesia technicians.
- Anesthesia technicians see themselves as members of a well-coordinated and supported practice community.
- The important contributions that anesthesiologists make to peri-operative care are acknowledged through appropriate recognition and remuneration.
- Anesthesiology is highly regarded as an enticing specialty thus attracting the brightest medical students.
- The supply of anesthesia providers is adequate to meet demands in surgery, obstetrics, critical care, pain management, and education.

Current Situation:

There is a severe shortage of anesthesiologists and anesthesia technicians in Rwanda. All the anesthesiologists are in the teaching hospitals and many of the technicians also practice in urban areas. Excellent surgical care will be difficult to realize until there is a critical mass of skilled anesthesia providers.

Recruitment to Anesthesiology: Medical students have three-week mandatory rotations in both anesthesia and in the ICU. During the anesthesia rotation, medical students observe anesthesia morning report and anesthesia provision in the operating room. They may occasionally be taught operating
room procedures (e.g. intubation, IV line placement, bag/mask ventilation). During their ICU rotation, the students round with the team in the ICU. There is some bedside teaching by the anesthesia staff, and the student may be asked to present a topic that pertains to critical care. However, the reality of the experience for the medical student during both these rotations is there is minimal teaching by either the anesthesia staff or the residents. The few anesthesia staff are overwhelmed with administrative and clinical duties leaving little time to mentor medical students.

Currently, medical students regard anesthesia as an unattractive specialty. They notice that hours are long, working conditions are difficult, there are few role models, and the status of the profession is low. Work in public health is known to be easier and more lucrative. Unfortunately, this results in anesthesia often being the last choice for medical students and available positions for residents remain unfilled. It will be tough to recruit to this specialty until the working conditions and remuneration improve.

There are five residency positions per year for anesthesia with the training period lasting four years. Therefore, there is capacity for twenty anesthesia trainees in total. Because recruitment to anesthesia residency has been difficult, for the reasons previously mentioned, as of January 2012, there are only eleven anesthesia residents. It has been a struggle to fill the available anesthesia positions. Since the anesthesia program began in January 2006, there has only been one female anesthesia resident and she left midway through residency. It is concerning the specialty is not more attractive to qualified female applicants.

Retention in Anesthesiology: As of January 2012, there are eleven consultant anesthesiologists in total in Rwanda. At Central Butare University Hospital (CHUB) there are four anesthesiologists, who are faculty of the National University of Rwanda, which is administered by the Ministry of Education. At Central Kigali University Hospital (CHUK) there are four consultant anesthesiologists, who are employed by the hospital. These positions are through the Ministry of Health. King Faisal Hospital employs three consultant anesthesiologists. It is a private hospital and, therefore, makes its own arrangements for remuneration. The clinical demands at CHUK are considerably greater but come with less remuneration than at King Faisal Hospital. This disparity leads to burn out and low morale with inevitable attrition. A sustainable solution to the disparity of income and clinical load would be to have one Department of Anesthesiology with rotation of faculty through the teaching hospitals and a higher level of remuneration. This would allow the teaching responsibilities to be shared by all.

With anesthesiologists being in such short supply, there is a pull between the need for specialists, who can build core areas of excellence, and generalists, who are able to provide a broad range of services. Staff anesthesiologists have been able to undergo sub-specialty training in critical care and cardiac anesthesia. There is also a need for sub-specialty training in pediatric anesthesia, regional anesthesia, obstetrical anesthesia, pain management, intensive care, and trauma management. However, the timing of fellowships will
need to be carefully arranged to avoid having too many staff anesthesiologists away at one time. When consultant anesthesiologists train for sub-specialties it is important that the conditions in Rwanda be attractive to encourage return to service in Rwanda. Consultants also need support in developing their skills in research and teaching methods.

**Anesthesia Technicians:** There are approximately 240 anesthesia technicians in Rwanda. The vast majority of anesthetics in Rwanda are administered in the district hospitals by anesthesia technicians. These technicians are in the difficult position of having to provide anesthetic care for the majority of surgery performed in Rwanda yet they have only completed a three-year program following high school. They often work in isolated settings with little equipment and sparse resources. There are few opportunities for continuing education, refinement of skills, mentorship or guidance.

The common themes for residents, consultants, and technicians are: inadequate numbers of staff, high clinical demands, and lack of support. When these problems are corrected anesthesiology and anesthesia technician practice will be more attractive thus improving recruitment, retention, and capacity for service.

**Workforce Targets:** The number of individuals in Rwanda qualified to provide anesthesia training is insufficient to meet anesthesia education needs in the country. Exacerbating this shortage is a lack of protected teaching time for anesthesiologists engaged both in undergraduate and postgraduate medical education. Job descriptions and terms of reference for clinician-educators remain unclear, limiting clinicians’ ability to plan and execute teaching duties. There is little mentorship available to faculty in the key academic areas of clinical practice, teaching and research, and inadequate opportunity to participate in academic conferences.

To address these shortages, the HRH program will produce an additional (28) 50 anesthesiologists by 2019 (Table 1). This increase shall address the staffing needs at all levels of the health pyramid structure as projected by the ministry.

**Table 1. Anesthesiology workforce targets, 2011-2019**

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**Student Targets:** The Anesthesia postgraduate program aims to increase first year postgraduate enrollment up to 10(6) in the first year of the HRH Program. This enrollment figure will be maintained throughout the program (Table 2).

**Table 2. Anesthesiology First year Enrollment Targets, 2012-2019**

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**Recommendations:**

1. **There must be a multifaceted approach to address the shortage of anesthesiologists in Rwanda, including attention to: education, lifestyle, workload, incentives, and competitive financial rewards.**

   A sustainable solution to the disparity of income and clinical load would be to have one Department of Anesthesiology with rotation of faculty through the teaching hospitals. Responsibilities should include: clinical service, research, teaching, and administration. Financial remuneration must be competitive with other areas such as public health. Possible incentives could include forgiving the debt for medical school. Incentives are essential for anesthesia to be an attractive specialty to allow for recruitment and retention. In the current situation of scarce resources, anesthesiologists need to be valued and treated equally to avoid attrition. A common funding mechanism, with a competitive salary, should be explored to encourage remaining in public service.

2. **Anesthesiology needs to become a more inviting specialty to medical students.**

   a. The entire profile of the profession of anesthesiology must be raised so that the specialty is seen as desirable and attractive to medical students. This will come with better remuneration, recognition, and attention to lifestyle issues. Strong incentives are needed for anesthesia to compete with public health for the best applicants.

   b. Rwandan staff anesthesiologists and the CASIEF/ASAGHO/CHAI volunteers should be asked to co-teach one session per month at the medical school. This would provide an opportunity to allow early exposure to anesthesia and would give the staff anesthesiologists a chance to develop a relationship with the medical students prior to their clinical rotations.

   c. A Faculty Coordinator for the medical student rotation in Anesthesia and ICU should be appointed to help coordinate the rotation. In addition, specific objectives for the medical student rotation in anesthesia and ICU need to be developed. As there is currently a shortage of anesthesiology
staff mentors for the medical students, anesthesia residents and technicians could help fill this role.

All of these steps would go a long way to improving the medical student’s perception of anesthesia. This would encourage attractive candidates who will raise the profile of the specialty.

3. Consultant anesthesiologists should be supported in achieving excellence as teachers and should be given opportunities to pursue training in sub-specialty anesthesia.
   a. Staff anesthesiologists should be questioned about their educational needs and goals. Continuing professional education opportunities, including mentoring in research and teaching methods, should be provided.
   b. The Rwandan anesthesiologists should be paired with CASIEF/ASAGHO volunteers in the formal teaching program. This will help the local staff build confidence in teaching.
   c. Individuals with sub-specialty interest should be identified for possible fellowships. Areas of greatest need are pediatric anesthesia, regional anesthesia, obstetrical anesthesia, pain management, intensive care, and trauma management. Even if an anesthesiologist completes a fellowship, it is essential that he or she maintain abilities in all areas of clinical practice.

2. EDUCATION

Ideal Goals:
- The Rwandan Society of Anesthesia, National University of Rwanda, and Kigali Health Institute set clear objectives and standards for training of anesthesiologists and anesthesia technicians.
  - Comprehensive curricula are developed to meet the above objectives.
  - Curricula are frequently evaluated and refined.
- There is an active program for continuing professional development for anesthesiologists and anesthesia technicians.
- A low-fidelity instructor-driven simulation centre provides an excellent educational opportunity for multi-discipline team training in technical and non-technical skills.
- The Rwandan Society of Anesthesia (anesthesiologists) and the Rwanda Association of Anesthesia (anesthesia technicians) host an annual conference to provide continuing education and to strengthen the network of anesthesia providers throughout Rwanda.

Current Situation:
Anesthesia Technician Education: There is currently a three-year training program at Kigali Health Institute for anesthesia technicians. Mr. Charles Rangira administers the program. CASIEF/ASAGHO volunteers teach one session per week, but this is often cancelled for administrative reasons. Rwandan anesthesiologists teach at KHI. This program is very important, as the technicians provide 90% of anesthesia services in Rwanda and work independently in the district hospitals.

There is no ongoing educational program for technicians in the district hospitals. As mentioned earlier in this document, there is currently no mechanism in place to provide refinement of skills, continuing educational opportunities, or mentorship for anesthesia technicians once they complete their studies at KHI and begin working in the district hospitals. There are no anesthesiologists in the district hospitals.

The Rwandan Society of Anesthesia (RSA) is the organization of Rwandan anesthesiologist; it is not currently active. The Rwanda Association of Anesthesia is the organization for anesthesia technicians. There is potential for these two societies to play a vital role in uniting anesthesia providers in diverse locations, setting standards of practice, and encouraging continuing education through an annual conference attended by both anesthesiologists and anesthesia technicians.

Anesthesia Residency Training: CASIEF/ASAGHO has partnered with the National University of Rwanda to support anesthesia residency training for the past six years. The first two graduates of the program finished in February 2010 and two more graduated in December 2011. Four Rwandan residents have completed six-month electives at Dalhousie University in Halifax, Canada. This was supported by CASIEF and Dalhousie University, Department of Anesthesia.

A significant problem with the residency program has been the shortage of mentors and role models. There are only a few anesthesiologists and those in practice have heavy demands on their time. Consequently, the residents are not routinely exposed to the level of vigilance and responsibility that would be expected in the North American/European training model. Without adequate supervision, substandard practice is not corrected and bad habits are perpetuated. Multiple CASIEF/ASAGHO volunteers have identified the lack of clinical teaching and supervision as a great obstacle to safe anesthesia care in Rwanda.

The chaotic environment found in the Rwandan operating theatres further hinders anesthesia residency training. When residents work with broken or missing monitors, they may fail to maintain minimum standards of practice. When basic essential pharmaceutical drugs are not available, they learn to give a poor quality anesthetic. When communication is not valued by the operating room culture, people work in silos. Many of these environmental issues are addressed in the section on infrastructure but their impact on the quality of resident training cannot be underestimated.
The multitude of challenges in teaching anesthesia residents in a resource poor setting are the focus of a curriculum revision by Drs. Livingston, Twagirumugabe and Uwambazimana. The former curriculum was a list of topics to be taught over two years. The revised curriculum is broader and addresses all aspects of the learning program. A full curriculum needs to include: aims and objectives; content; teaching and learning methods; assessment; creation of a positive learning climate; and processes of monitoring and evaluation. Effective teaching strategies involve: preparation, activation of prior knowledge, interactive teaching, opportunities for application, repetition, case based learning, simulation, goal setting, reflection, and feedback. A good curriculum must account for the unique needs of learners in the local environment. The new curriculum, started in January 2012, seeks to achieve these goals.

**Simulation:** Simulation has been recognized as a valuable education tool as it allows learners to practice skills, receive feedback, and practice again without risking harm to patients. High-fidelity simulation, which uses complicated interactive mannequins, is expense to acquire and maintain. Low-fidelity instructor-driven simulation can create an authentic learning environment with minimal cost. This form of simulation uses a simple mannequin, a laptop with a simulation program (which allows the instructor to manipulate vital signs), a computer monitor (which displays the vital signs as the practitioner would see in an operating room monitor), and a setting that resembles an operating room. When scenarios are written well, a credible environment can be created. This form of simulation can be used to teach management of rare, but serious, events and to train teams for effective communication during critical situations.

Mannequins (both adult and neonatal), a laptop, monitor, and simulation program have all been provided through the CASIEF program. The only current requirements are a designated space and instructor training.

Scenarios can be used to teach medical students, nurses, technicians, and anesthesia and surgical residents. It is particularly useful to bring multi-discipline teams together. The team approach to crisis management can be taught and reinforced in this environment without putting patients at risk. A simulation centre also functions as a place to teach more simple technical tasks such as IV line placement, bag/mask ventilation and intubation.

**Research:** Several collaborative research projects are underway between anesthesia residents and staff at NUR and colleagues from North American Universities. Current research studies have been designed to the highest ethical standards (passing REB approval at NUR and in the university of the ex-patriot partners) and the population most benefitting from the study is the Rwandans.

**Recommendations:**
1. **Partnership between the Rwandan Society of Anesthesia, the Rwanda Association of Anesthesia, and the National University of Rwanda needs to be further developed with a goal of comprehensive education for anesthesia technicians.**

   The goals and objectives of anesthesia technician training should be further refined and evaluated to determine if they meet the appropriate requirements for providing safe anesthesia care in both the district level hospital and urban centres.

   The role of volunteer anesthesiologists in teaching at KHI needs to be defined. It is currently unclear whether there is a wish for volunteer anesthesiologists to continue to teach at KHI. In the past, the students have expressed great enthusiasm for the teaching sessions from CASIEF volunteers.

2. **A strong program of refresher courses, covering common anesthetic problems, should be offered Anesthesia technicians working in both district hospitals and urban centres.**

   The World Federation of Societies of Anesthesiologists (WFSA), the Ugandan Society of Anaesthesia, and the Association of Anaesthetists of Great Britain and Ireland (AAGBI) have started developing a series of courses called Safer Anaesthesia From Education (SAFE). The first course, entitled SAFE Obstetric Anesthesia, has already been successfully run in Uganda. These short, practical courses have potential to increase safe anesthesia practice by providing a clear and organized approach to common anesthesia issues. In addition to the course on obstetrical safety, there are plans to develop future courses to cover such critical topics as: pediatric anesthesia, trauma care, and pain management. As well as providing a venue for continuing professional education, such courses allow people to make connections and develop networks for communication. These relationships are vital for people working in remote settings.

3. **The anesthesia residency program needs to be strengthened by continuing to refine the curriculum, building a strong cadre of local teachers, and by addressing the obstacles to safe operating room practice.**

   The new anesthesia residency curriculum has been introduced in January 2012 and seeks to address many of the current deficiencies. It will need to be carefully evaluated and modified as circumstances change. The cadre of local teachers is growing, as more residents graduate, however, they need continued mentoring in teaching skills. This can happen by pairing Rwandan faculty with CASIEF/ASAGHO volunteers for academic teaching and by courses in teaching methods for the local faculty. The issues related to the operating room learning environment are discussed in the next section on infrastructure.
4. There is a need for designated space and staff support for a low-fidelity instructor-driven simulation centre.

5. The Rwandan Society of Anesthesia and the Rwanda Association of Anesthesia should be active in uniting anesthesia providers in diverse locations, setting standards of practice, and encouraging continuing education through an annual conference.

6. Ethically sound, collaborative research projects should be encouraged when then main beneficiaries of such studies are the Rwandans.

3. INFRASTRUCTURE
   a) Equipment, monitors, and drugs

   **Ideal Goals:**
   - Equipment, monitors, and drugs meet the minimum standards set by the World Federation of Societies of Anesthesiologists and the World Health Organization.
   - There is a national system for drug procurement and distribution.
   - There are skilled technicians who can service and maintain equipment in good working order.
   - The operating rooms are stocked in a systematic manner.

   **Current Situation:**

   *Equipment Overview:* Anesthesia is a profession for which equipment, monitors and drugs are essential to safe practice. The World Federation of Societies of Anaesthesiologists, through widespread consultation and an iterative process, established International Standards for Safe Practice of Anesthesia in 2010\(^1\). This document specifies recommendations for rural hospitals, district hospitals and referral hospitals. Standards are also designated as suggested, recommended, or highly recommended. This report provides a valuable reference as Rwanda seeks to improve capacity for surgical services.

   *Anesthesia Machines:* Central University Hospital of Kigali (CHUK) is a large teaching hospital and referral centre. There are six operating rooms in the main department and another two in the maternity pavilion. Four new Datex Aespire anesthesia machines were purchased approximately three years ago. The other anesthesia machines are older Glostavent machines. Central University Hospital of Butare (CHUB) has poorly functioning anesthesia machines that would not meet minimum standards. It is often necessary at CHUB to combine two or three anesthesia machines together to get one fully functioning unit.
When the new anesthesia machines were purchased for CHUK, they also came with well functioning anesthesia monitors. Unfortunately, there are few technicians who are able to maintain and repair the equipment. Volunteer anesthesiologists have noticed that equipment that was properly functioning a few years ago is now broken and items are missing.

Equipment Maintenance and Repair: There is little ability to fix broken anesthesia equipment or trouble shoot equipment problems. For example, one volunteer commented there was only one laryngoscope handle for six operating rooms. He found a storeroom with 23 handles, of which 16 were perfectly functional with new batteries. Volunteers have brought equipment, such as blood pressure cuffs and oximeters, to leave in Rwanda but have been discouraged to find it gone when they return for the next teaching mission. The question has been raised about diversion to private practice.

Finding appropriate and functioning monitors at CHUK remains a huge challenge. Much time is wasted each morning trying to locate supplies to safely perform the anesthetic. For example, finding an automatic BP cuff that works can be an arduous task. It can take over an hour to gather the necessary supplies to perform a safe anesthetic. Even more concerning, the anesthesia residents and techs are prepared to provide anesthesia without adequate equipment as they have become accustom to standards that are unsafe and that should not be acceptable. They may find it necessary to give an anesthetic without measuring blood pressure or using pulse oximetry. Some very young children are anesthetized with only an ECG (no blood pressure, no pulse oximeter, no temperature, and no precordial stethoscope). When these problems are not corrected, they become normal and accepted.

Equipment and monitor malfunction is so common that anesthesia providers often ignore audible alarms. Even when monitors are present, there are huge problems with interpretation of data and appreciation of its clinical significance.

Non-functional equipment is often just returned to a drawer to frustrate the next person who tries to use it. In each hospital, there is a need to designate someone to be responsible for organizing the anesthesia equipment. This person should ensure the operating rooms are stocked in a systematic manner.

Pulse Oximetry: Pulse oximeters are essential monitors that WFSA has designated as required for every anesthetic. Pulse oximeters provide vital information about tissue oxygenation and circulation. Unfortunately, there are few working pulse oximeters in Rwanda. Dr. Angela Enright and colleagues at the WFSA are leading a campaign to supply many developing countries with sturdy pulse oximeters. The pulse oximeter is the Lifebox and more information can be found at: [http://www.lifebox.org/](http://www.lifebox.org/) CASIEF has committed to providing 250 pulse oximeters to Rwandan operating rooms. These oximeters should be arriving in Rwanda during 2012.
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*Equipment for Pediatrics:* One of the gravest problems at CHUK is finding equipment necessary to safely anesthetize children. There is no warming equipment and children have died from profound hypothermia. It is difficult to find blood pressure cuffs and pulse oximeters that are appropriately sized for small children. It is not uncommon to resort to giving an anesthetic without any monitors to young children.

*Drugs:* There are frequent problems with running out of necessary drugs for anesthesia, pain management, and obstetrical care. Some essential anesthetic medications are unavailable or rarely available, such as: muscle relaxants, propofol, IV beta-blockers, magnesium, labetalol, and hydralazine.

One of the more serious problems is the poor access to safe and reliable bupivacaine, a local anesthetic essential for spinal anesthesia. This medication has been purchased from the least expensive provider in India. Unfortunately, a few patients have suffered from severe adverse reactions (including death) and, more commonly, the bupivacaine is often ineffective. This is a serious issue as spinal anesthesia is typically a safer option than general anesthesia when oxygen supply is erratic and is the technique of choice for Cesarean section.

Essential medication for pain management is badly needed. Patients continue to suffer in severe pain because of the lack of oral morphine.

*District Hospitals:* In the district hospitals, supplies are poorer and many of the hospitals do not have anesthesia machine or basic anesthesia equipment. Some district hospitals lack reliable access to essential services like water and electricity.

*Solutions:* Some of these equipment problems can be solved at minimal expense. For example, improving accountability for storage and organization of equipment does not need more funds. It would be relatively inexpensive to train a few technicians who are capable of equipment maintenance and repair. The Lifebox pulse oximeters will be provided to Rwandan hospitals as donations. If the same equipment were purchased for hospitals through a common mechanism, this would facilitate maintenance and repair. All anesthesia providers can become familiar with minimum monitoring standards and problem recognition can improve with education.

*Recommendations:*

1. **Rwandan operating theatres should strive to adhere to essential standards for drugs and equipment for safe practice of anesthesia as outlined by the World Federation of Societies of Anesthesiologists.**

2. **Essential medications for anesthesia, as specified by the World Health Organization, should be available.**


3. Each hospital should designate a person to be responsible for organization of anesthesia equipment.

4. There is a critical need for biomedical technicians who can handle equipment maintenance and repair.
   There is an excellent training program for biomedical technicians offered in Kigali by Engineers World Health.

**b) Peri-operative services**

**Ideal Goals:**

- Leaders in anesthesia, nursing, and surgery work together for safe and efficient operating room function.
- A coordinated plan is in place to ensure smooth patient flow from pre-operative assessment to surgery to post-anesthesia care and, finally, to the wards.
- Using the Surgical Safety Checklist for all operative procedures enhances team communication.
- Post anesthesia care unit is well staffed and clear protocols exist for managing common post-surgical problems.
- Obstetricians, nurses and anesthesia providers practice as a team to improve maternal safety.
- Multi-discipline morbidity and mortality rounds are held regularly to promote a culture of reflection to improve patient safety.
- Pain is routinely evaluated and managed.

**Current Situation:**

*Leadership:* Operating rooms are complex environments where multiple factors must be coordinated for smooth patient flow and a prompt response to critical events. Currently, care is often fragmented with people responsible for their own areas but little overview of what is needed for a patient to move well through the operating room system. This can be improved by introducing evidence-based protocols for patient care and for managing untoward events. It will also help for leaders in anesthesia, nursing, and surgery to work together to solve complex problems.

Operating rooms, particularly at CHUK, have multiple anesthesia providers such as technicians and residents. Roles may not be clearly specified within the anesthesia team. Without defined leadership, there is a tendency to look at one aspect of the anesthetic care rather than seeking a global
understanding. At times, no one appears to be responsible for the case. It is essential that one person be designated as the anesthesia leader responsible for each case to provide truly excellent care. This person could be a technician, resident or staff person; the essential aspect is role clarification within the team. Roles should be clarified to all in the operating rooms prior to induction, as specified by the WHO Surgical Safety Checklist.

Operating room organization could be improved by designating a daily coordinator for anesthesia, nursing and surgery. Each of the coordinators would be in charge of delegating specific roles for each of their team members. Together they could help prioritize urgent/emergent cases. The coordinators from anesthesia, nursing and surgery would be responsible for smooth and efficient function of the operating room. Responsibilities would include daily scheduling issues and triaging emergency cases.

**Communication for Patient Safety:** Communication in the operating room is extremely important yet the operating room lacks communication protocols found in other high-intensity professions\(^2\). Human factors, such as poor teamwork and ineffective communication, can jeopardize patient safety in the operating room. Estimates are that 70 to 80% of anesthetic and surgical untoward events are caused by human factors\(^3\).

Reason describes accidents as resulting from breaches in an organization’s layers of defense\(^4\). This means that when accidents occur there are often many elements in the system that create an unsafe situation rather than just one individual making a mistake. Safety can be improved by looking at all aspects of the environment and building in safeguards.

An important safeguard is found in the WHO Surgical Safety Checklist (SSCL), which has been demonstrated to be a valuable tool to promote safety and improve operating room communication\(^5\). The SSCL requires communication between anesthesia, nursing, and surgery at three points: before induction of anesthesia, before the surgical incision, and at the completion of surgery prior to transfer to the postoperative ward. The SSCL helps to develop a shared understanding about the patient, the procedure, and the clinical roles of the members of the care team. It opens the lines of communication and allows anyone present to express safety concerns. The SSCL has begun to be implemented in Rwandan teaching hospitals.

Very positive communication occurs at the daily morning report for the anesthesia team at CHUK and twice weekly in CHUB. These meetings allow discussion of challenging cases with planning for anesthesia management.

Communication between anesthesia, surgery and nursing could improve with regular cross-disciplinary morbidity and mortality rounds to improve the team approach to problem solving.

**Handover:** Transfer of care between anesthesia providers and others has been noted as being inadequate. This is particularly true between operating room and recovery room staff. This may be addressed by educational efforts and by ensuring there is one anesthesia provider designated as responsible for each
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Recovery Room: Recovery room is understaffed and chaotic. Patients are sometimes left in the recovery room without a report being provided to the nurses as the nurse is either busy or absent. Volunteers have commented on observing times when there are patients in the recovery room but no nurse is present. This is unsafe, substandard, and should not be acceptable. Clear policies must be implemented to address this deficiency in recovery room care. These policies must address issues such as staffing, transfer of care, monitoring, pain management, and discharge criteria. Recovery room has also been used as a place to leave patients when there is no ward bed available. Volunteers have reported that patients have been left in recovery room for as long as one month.

One staffing issue in recovery room at CHUK is the lack of designated nurses for that area. Nurses from the operating theatre rotate through recovery room. They often lack familiarity with management of common problems encountered by patients emerging from anesthesia. This problem could be addressed by designating specific nursing staff to be educated as resource nurses who are permanently located in recovery room. These nurses can be responsible for supervising less experienced staff.

Obstetrical Care: Current challenges to obstetrical care at CHUK include: inadequate anesthesia equipment and monitors; lack of essential obstetrical medications (such as labetalol, hydralazine, and, sometimes, magnesium); and inadequate communication between anesthesia providers and obstetricians. Communication could be greatly enhanced by regular morbidity and mortality rounds between these services and by working together to develop protocols to improve maternal care.

Pain Management: Pain management needs improvement. Outside of the operating room, there has been collaboration between visiting pain management nurse educators and physicians and nurses, pharmacists and physicians in Rwanda. This visiting team of pain specialists has been working to teach basic pain assessment and treatment. The ability to treat pain has been hindered by lack of pain education in physicians and nurses. There is a great reluctance to use opioid medication appropriately, when indicated. There is also a severe shortage of available oral opioid medication.

A Rwandan Pain Society was formed in 2010. Meetings are held bimonthly and include representatives from many disciplines. Rwanda is actively developing a national palliative care program. CHUB is developing a small pain management ward, which will be staffed by nurses with special pain management training. This ward could accept patients with significant pain needs, such as severe cancer pain or post-surgical pain. With time, the experience of the nurses will increase and they will be able to educate others.
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CHUK is also exploring this option. There is still a significant need for pain education and this is scheduled to continue as part of the CASIEF mandate.

The Louise and Allan Edwards Foundation of Montreal for educational development in Pain Medicine has generously provided support for pain management education in Rwanda for the past three years. The Foundation has provided funds to send two Canadian pain management nurse specialists to Rwanda each year for a month at a time. These nurses have taught doctors, nurses, pharmacists, and technicians in Kigali and Butare. The Foundation has also provided funds to sponsor three-month training in Montreal, Canada for a senior nurse and a clinical pharmacist.

**Recommendations:**

1. Leadership in anesthesia, nursing, and surgery is needed for smooth communication to coordinate operating room activities.
   a. The WHO Surgical Safety Checklist should be performed before all surgical procedures.
   b. When working together, it is essential for anesthesia providers to clarify roles and designate leadership.
   c. Operating room safety and efficiency would be improved with daily coordinators for anesthesia, nursing and surgery.
   d. Morning report for the anesthesia team should continue as an excellent time to build team communication and plan for safe practice.
   e. Multi-disciplinary morbidity and mortality rounds between anesthesia and surgery should be held once monthly.

2. Dedicated staff with appropriate education and protocols is needed in recovery room.

3. Team coordination between anesthesia, obstetrics, and nursing is needed to develop protocols for safer maternal care.

4. Pain management can be improved by education, policy development, and improving access to essential medications.

The International Association for the Study of Pain (with input from members from 130 countries) has found pain is inadequately managed in most of the world. The Declaration of Montreal (2011) says that pain management is a fundamental human right.


a. There is a need for pain management education and advocacy.
   b. Small units for patients with significant pain management needs can be established in the tertiary care hospitals. The staff in these units can
receive further education in pain management principles and can then become resource people to educate in other areas of the hospital.
c. Through the Rwandan Pain Society, Childkind certification should be sought for the tertiary care hospitals in Rwanda. This certification is awarded to hospitals that have clear protocols and resources to effectively manage pediatric pain.

http://www.childkindinternational.org/ChildKind_International/Home.html
d. A national palliative care policy has begun in Rwanda. This should be fully implemented.
e. Oral opioids, particularly morphine, are badly needed for severe pain management. A coordinated effort is needed to ensure the supply of these essential medications. Governmental policy must be designed to allow for ease of use of these drugs in the proper situations.

CONCLUSION
There are many challenges to providing safe anesthesia in Rwanda but there is great potential for improvement. There is already a strong core of anesthesia providers and their numbers of growing. The longstanding CASIEF/ASAGHO partnership has assisted greatly in education for anesthesia residents. Volunteer teachers consistently comment on dramatic improvements each time they return to Rwanda. We hope that the evaluation of issues and suggested solutions outlined in this document will guide the development of anesthesia excellence and build capacity for safe surgery in Rwanda.


