Rwanda Human Resources for Health Program, 2011-2019

Funding Proposal

PART I

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I. Program Description and Rationale

The **Human Resources for Health (HRH) Program** aims to build the health education infrastructure and health workforce necessary to create a high quality, sustainable healthcare system in Rwanda.

Rwanda has made impressive progress towards meeting the health-related Millennium Development Goals (MDGs) and its own ambitious targets for improving the health of its people by 2020. For example, under-five mortality rates in Rwanda declined from 152 to 76 per 1,000 between 2005 and 2010; the rate of deliveries assisted by skilled staff increased from 39% to 69%; and the percentage of women between 15 and 49 years of age using modern contraceptive methods increased from 10% to 45% during the same time period.

'Diseases of poverty' such as malaria, diarrheal disease, and many neglected tropical diseases have all been rolled back. In addition, major advancements have been made in the prevention and management of HIV. In 2002, only a few hundred people were being treated for AIDS in Rwanda. Today, over 84,000 people living with HIV are receiving antiretroviral treatment, which represents over 80% of the population in need. These results are among the best in the world.

Despite these accomplishments, maternal and child illness is still too high in Rwanda, and the burden of poorly treated diseases is substantial. To make further progress, Rwanda must improve its health workforce. Currently, Rwanda has only 633 physicians for a population of over 10 million people. There are only 6,970 Rwandan nurses, about 90% of whom have the lowest level of nursing training available. A mere 10 Rwandan dental surgeons serve the entire country.

The World Health Organization (WHO) considers Rwanda to be one of 57 countries worldwide with a critical shortage of health workers. Indeed, the health worker density in Rwanda is only .72 per 1,000 persons[1], which is less than one-third of the WHO minimum density of 2.3[2] – the threshold required to achieve some of the most basic health outcomes. In most cases, Rwanda's ability to ensure adequate levels of healthcare for its citizens is hampered by insufficient equipment and infrastructure at Rwandan healthcare and training facilities, as well as by a lack of individuals with high quality training in healthcare and healthcare management.

The HRH Program strategically, systematically, and comprehensively addresses the most challenging obstacles to high quality healthcare in Rwanda:

- Critical shortage of skilled health workers;
- Poor quality of health worker education;
- Inadequate infrastructure and equipment in health facilities;
- Inadequate management of health facilities.

The HRH Program will address these obstacles by dramatically increasing the number, quality, and skill-level of Rwandan clinicians and health sciences educators, including medical doctors (general practitioners, specialists, and subspecialists), nurses and midwives, and oral health

[1] Ministry of Health, 2011.
[2] WHO, 2006.

professionals. This substantial scale-up will be achieved with the assistance of an unprecedented consortium of 19 of the top US educational institutions. Each university has committed to sending full time faculty members to Rwanda to help improve teaching, research, curriculum development, and mentorship.

Through the HRH Program, infrastructure and equipment in Rwanda's teaching hospitals and educational facilities will be upgraded to provide an optimal environment for patient care where students can learn hands-on. In addition to clinicians, the HRH Program will also focus on training high quality health managers to direct Rwanda's hospitals and district health units, enabling clinicians to deliver optimal patient care. The Government of Rwanda is confident in its ability to achieve this world-class health education system within an eight year time frame. After this point, US faculty and financial assistance will be phased out and there will be sufficient Rwandan educators, infrastructure and equipment, and domestic financing to support Rwanda's healthcare and health sciences education without external support.

The Government of Rwanda proposes to manage the HRH Program directly, rather than through an NGO or other third party. Rwanda has already established a strong record of success in leading donor-funded health projects of a similar scale and complexity. In the case of the HRH Program, direct management will minimize the inefficiencies that can arise when accountability is spread across multiple stakeholders and streamline the coordination efforts that are critical to the success of this ambitious undertaking. Direct management of the HRH Program by the Government of Rwanda is also consistent with the *Global Health Initiative's* stated goals of fostering country-led programs that build local capacity and make health improvements sustainable.

All project goals and strategies have been developed to achieve complete sustainability. After eight years, the Government of Rwanda will operate the HRH Program within its own budget.

II. Goals

The principal goal of the HRH Program is to build a sustainable, high-quality health workforce capable of providing the citizens of Rwanda with world-class healthcare. To achieve this vision, the HRH Program will accomplish the following goals within the project's eight-year time frame:

- Increase the number of physicians from 633 to 1182, and the number of specialists[3] in areas such as internal medicine, family and community medicine, obstetrics and gynecology, pediatrics, surgery, and anesthesiology from 150 to 551.
- Dramatically advance the skill level of nurses/midwives by increasing the number of nurses/midwives with A0 credentials from 104 to 1,011 and the number of nurses/midwives with A1 credentials from 797 to 5,095. These actions will increase the overall number of nurses/midwives from 6970 to 9178.
- Introduce the role of 'health manager' into the Rwandan health system and increase the number of trained health managers from 7 to 157.

[3] Specialists in Rwanda would often be considered generalists in the US system, such as internists. Subspecialists as defined in Rwanda, such as cardiologists, would often be considered specialists in the US. Rwandan terminology is used in this proposal for consistency.

- Launch the Rwanda School of Dentistry, and increase the number of oral health professionals from 122 to 424.
- Build the institutional capacity of the medical, nursing, oral health, health management schools and clinical teaching hospitals in order to sustain high quality health education.

These ambitious targets were established with careful consideration of the existing capacities of Rwandan institutions. The key obstacle to building the health workforce in Rwanda is the inability of Rwandan schools of medicine, nursing and midwifery, dentistry, public health, and clinical teaching hospitals to offer adequate levels of teaching, clinical training, mentorship, research experience, and opportunities for advanced/specialized study. With that in mind, the primary focus of the HRH Program is to dramatically and sustainably develop the Rwandan health education system. This strategic approach will not only enable Rwanda to achieve the above targets within eight years; it will also lay the foundation for a strong and vibrant health workforce in Rwanda for generations to come.

III. Implementing Capacity of the Government of Rwanda

The Government of Rwanda has extensive experience managing large grants from foreign donors. To demonstrate the Government of Rwanda's commitment to international donors, the Rwanda Cabinet endorsed the *Rwanda Aid Policy* in 2006. The purpose of this policy is to increase the efficiency and efficacy of how external aid is received and managed by the Government of Rwanda. See Appendix 16 for further background information.

Since then, the Government of Rwanda has established an exemplary record of managing project funds of similar scale and complexity as the HRH Program. Currently, the Government of Rwanda is accountable for funds awarded by the Global Fund for AIDS, Tuberculosis, and Malaria and the World Bank. In the past, it has also managed funds from the UK's Department for International Development (DFID). To date, the Global Fund has disbursed over USD $448 million to the Government of Rwanda. The World Bank currently provides USD $15 million in funding, and the cumulative World Bank portfolio managed by the Government of Rwanda is USD $42 million. DFID has awarded USD $7 million.

These projects have demonstrated that the Government of Rwanda is not only able to manage significant amounts of donor funding; it is also able to put them to excellent programmatic use. Funds awarded by the Global Fund, for example, were efficiently employed to implement large-scale HIV, malaria, and tuberculosis treatment and prevention programs that produced impressive results on the ground.

Overall, the Government of Rwanda is committed to sound financial management and transparency in all sectors and has proven its ability to responsibly manage the national budget. Priority Expenditure, a program that allocates resources to pro-poor needs, has increased over the past five years. Rwanda has also benefited from both the Heavily Indebted Poor Country and Multilateral Debt Relief initiatives, resulting in a sustainable debt position.

Taken together, these government-led efforts have achieved significant gains for the health of the population of Rwanda. This efficient and empowering approach to project financing and

implementation has worked in Rwanda, which is why the Government of Rwanda now requests a similar approach from the US Government for the HRH Program.

IV. Partners

The Government of Rwanda has convened a consortium of 19 US-based institutions of medicine, nursing and midwifery, dentistry, and public health. Each of the participating institutions has agreed to recruit and send full time faculty to Rwanda to build the capacity of the Rwanda health system. They have also agreed to a set of exemplary principles that are in line with the *Global Health Initiative's* goal of increasing the efficiency and effectiveness of Aid from the US Government.

To the best of our knowledge, the HRH Program's Academic Consortium will be by far the largest cooperative global health effort ever undertaken between universities in the developed and developing world.

Table 1. US Academic Consortium Institutions

Medical Schools
Brown University
Duke University
Dartmouth College
Harvard University
University of Colorado
University of Maryland
University of Texas
University of Virginia
Yale University
Schools of Nursing
Duke University
Howard University
New York University
University of Illinois at Chicago
University of Maryland
University of Texas
University of Virginia
Schools of Public Health
Yale University
Schools of Dentistry
University of Maryland
Harvard University

The exemplary principles within which these institutions will operate are outlined below. All US universities that are part of the HRH Academic Consortium have reviewed and accepted these principles.

1) The Government of Rwanda will manage the HRH Program and will contract with participating US Universities directly. Funds will flow from the US Government to the Government of Rwanda who will be responsible for contracting and program management.
2) Participating universities will not charge any general overheads to this program.
3) Administrative costs will be limited to 7% of the total direct costs spent on faculty recruited by a university. During the planning phase, the direct costs of professors working on the planning will be paid and these will be added to the direct cost base for purposes of assessing the administrative overhead. The low administrative costs are made possible by the fact that the Government of Rwanda will assume costs that typically would be carried out by individual universities and will achieve economies of scale in doing so. Contracts will be standardized so that universities will not have to spend resources on contract negotiation. Consortium administration will be done in Rwanda by the Government so that very little program administration will be necessary at participating universities. Paperwork and filings will be held to a minimum. Malpractice insurance and licensure will be coordinated by the Rwanda Government as part of the program so that participating universities will not have to bear these costs. Universities will incur some recruiting costs and costs for minimal part time administrative functions but this should be all.
4) US faculty will live and work in Rwanda for at least one academic year (eleven months) and longer-term commitments will be encouraged. Their salary and benefits will be lower than they could obtain at their universities in the US. This reflects the fact that the HRH Program is a development project meant to serve poor people in a resource poor country and also reflecting the fact that this is an educational opportunity for the US faculty. Health insurance including emergency evacuation insurance, adequate housing, round trip airfare, and other basic benefits will be provided.
5) All contracts, financials and other information related to the HRH Program will be public and subject to posting on the Internet.
6) Faculty recruited by US institutions can remain on their institution's payroll or can be seconded to the payroll of the Rwandan schools at the discretion of the US institution.
7) Research undertaken related to the HRH Program by US faculty must be co-authored with Rwandan researchers and must adhere to the conditions established by the Rwandan Authorities.
8) The ideas of all US universities and faculty participating in the Program will be welcomed on how to organize health education and the healthcare system in Rwanda. However, the Government of Rwanda and its institutions will be the ultimate decision makers.

If successful, the US Academic Consortium has the potential to serve as a model for similar collaborations throughout Africa and in other developing economies.

A number of US universities already work in Rwanda. Yet typical capacity-building or medical mission type programs tend to be limited in scope, focused on the achievement of small targets, rather than large sector-wide improvements. The complexity of managing myriad small separate partnerships can be difficult and costly for the Government of Rwanda. Moreover, the current fragmented patchwork of partnerships will never achieve the scale needed to have a transformative and sustainable impact on the Rwandan health education system.

By contrast, the HRH Program will coordinate the work of multiple institutions in an integrated fashion to produce a large, measurable result. The engagement of these institutions will be carried out within a comprehensive program that includes the upgrade of the clinical teaching hospitals where critical learning will take place. The model of the US Academic Consortium, coupled with the HRH Program overall, will deliver many times the impact that even the most qualified institution could ever achieve alone.

V. Strategy and Technical Approach

Each area of work outlined below is critical to achieve the HRH Program goal of producing high-quality health professionals and health educators. The approach will be systems-based and government-led, ensuring that achievements are not only sustainable, but also help build a strong foundation for future health sector development initiatives. Specific areas of work within the HRH Program include the following:

A. Increase skill levels and specialization of healthcare professionals and educators;

B. Establish high-quality clinical training sites and schools;

C. Accelerate recruitment and support student retention;

D. Implement integrated, competency-based curricula;

E. Increase the importance of teaching and careers in health professions;

F. Build institutional capacity for health education;

G. Expand research partnerships and academic exchange.

These areas will each be carried out in the fields of medicine, nursing and midwifery, health management, and dentistry over the course of 8 years. An overview of the activities are provided in this section, while further technical detail and plans for implementation can be found by cadre and specialty from Appendix 5 through Appendix 8.

A. Increase skill levels and specialization of healthcare professionals and educators

The Government of Rwanda is focused not only on increasing the number of health workers, but also with the skill mix of the country's health workforce and its ability to comprehensively meet the country's health needs. The HRH Program presents a detailed and thorough strategy for increasing the skill-level of health professionals. It will also ensure the replenishment of this quality workforce into the future by building the capacity of Rwandan health educators. For physicians and nurses/midwives, this means increasing specialization and upgrading skill levels, as well as providing specialty training for new and existing faculty and clinical mentors. For oral health professionals and health managers, this means creating new degree programs to fill critical gaps in the health workforce and to produce graduates that can go on to become faculty. For all health cadres, the diversification and increased skill level of Rwanda's health workforce will dramatically improve the quality of healthcare available in Rwanda and strengthen the health education system to continue assessing and meeting training needs.

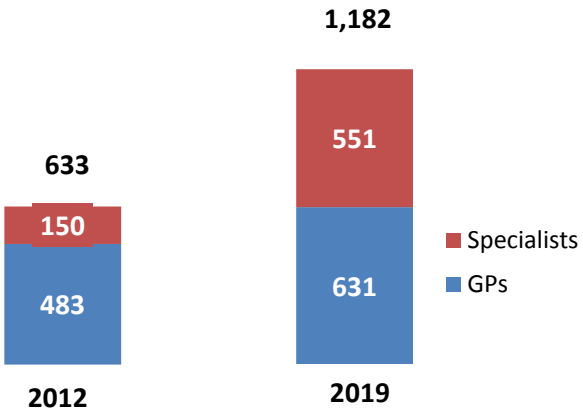
Initially, US faculty will play a key role in filling gaps in both clinical and classroom settings, directly teaching students while also mentoring existing faculty and training new faculty. Relationships between mentors from US institutions and their Rwandan counterparts at teaching institutions and clinical training sites will encourage direct transfer of knowledge and skills. The principles behind mentorship – that learning should be hands-on, active, and team-based – are highly applicable to Rwanda's goal of building a sustainable health workforce. Today's mentees will become tomorrow's mentors, ensuring long-term succession of this intensive investment in human resources for health.

US faculty will work as mentors alongside Rwandan faculty, transferring capacity to teach critical cadres within the health workforce. Not only will the infusion of US faculty improve faculty to student ratios in Rwandan schools, but the intensive investment in training within these cadres will catalyze the number of graduates within each cadre. In addition to peer-to-peer mentoring, US faculty will provide crucial support in development and revision of curricula, program design, and research initiatives. The partnership between Rwandan teaching institutions and the US universities will result in more effective teaching, strengthened training programs and institutions, and ultimately more quality health professionals to serve the needs of the country.

1. Physicians

At the Faculty of Medicine, the effort to increase the skill level of trainees will broaden the physician workforce to include a dramatic increase in specialists and subspecialists. By the end of 2019, there will be 631 General Practitioners (GPs) and 551 Specialists in Rwanda (Figure 1). While a critical mass of GPs is necessary in the health system, the lack of specialists creates a concern about the quality of care available in public health facilities. Between 2012 and 2019, the Ministry of Health aims to graduate a total of 401 specialists in at least 14 different focus areas.

Figure 1. Workforce Targets for Physicians, 2012-2019



The main residency programs – Internal Medicine, Family and Community Medicine (FAMCO), Pediatrics, Obstetrics and Gynecology (Ob/Gyn), Surgery, and Anesthesiology – will account for most of the increase in specialists by adding 347 new graduates in these areas (Table 2).

Table 2. Projected Workforce of Physicians in Rwanda, 2012-2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 19)
General Practitioners	470	483	502	522	551	569	590	611	631	148
Anesthesiology	8	11	16	16	19	24	29	34	39	28
FAMCO	0	0	7	7	12	21	37	53	69	69
Surgery	6	14	23	23	27	36	48	60	72	58
OB/Gyn	19	21	31	31	38	50	62	74	86	65
Pediatrics	14	15	24	24	30	38	51	64	77	62
Internal Medicine	12	15	22	22	29	38	52	66	80	65
MAIN RESIDENCIES TOTAL	**59**	**76**	**123**	**123**	**155**	**207**	**279**	**351**	**423**	**347**

In internal medicine, pediatrics, obstetrics/gynecology and surgery, rotating sub-specialists from the US will provide modular teaching of critical subspecialties. In internal medicine, for example, sub-specialists in cardiology, pulmonology, nephrology, gastroenterology, and hematology/oncology will teach advanced modules to Rwandan postgraduates.

A small number of postgraduates will be sent abroad for training in subspecialty areas that are currently unavailable in Rwanda and cannot be established in the short to medium term. During the course of the HRH Program, a total of 36 people (including postgraduates and junior faculty) will study abroad. This international training will ensure a fairly comprehensive availability of future subspecialty services in Rwanda. It will also produce a generation of new subspecialist faculty who will return to Rwanda to train other specialists in-country. This will allow Rwandan faculty to replace the US faculty in teaching the advanced subspecialty modules by the end of the HRH Program in 2019.

To achieve the desired quality and quantity of physicians in Rwanda, existing faculty will need to improve their teaching skills and new specialist and subspecialist faculty will be needed to sustain the postgraduate programs into the future. The HRH Program aims to train three groups of Rwandan faculty in different ways: 1) in-country mentorship and training of existing faculty; 2) in-country mentorship and training of new faculty; and 3) subspecialty training of select new or junior faculty members. The Ministry of Health plans to convene a meeting of stakeholders before the 2012 academic year to further outline a work plan to train the future faculty of Rwanda.

The US Academic Consortium will provide approximately 327 full-time physicians over the course of the HRH Program. Based on the gaps identified in Rwanda's *HRH Strategic Plan 2011-2016*, most of the US faculty (250 FTEs) will focus on six main residencies: anesthesiology, surgery, pediatrics, obstetrics/gynecology, FAMCO and internal medicine (Table 3). Starting in Year Four, the number of US faculty will decrease over time and eventually phase out as capacity is built among Rwandan faculty.

Table 3. Number of US Faculty for Main 6 Residencies, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Anesthesiology	4	4	4	2	2	2	1
FAMCO	6	6	6	6	4	2	1
Internal Medicine	11	11	11	9	7	5	2
Ob/Gyn	9	9	9	7	5	3	2
Pediatrics	10	10	10	8	6	5	2
Surgery	10	10	10	7	6	4	2
TOTAL	**50**	**50**	**50**	**39**	**30**	**21**	**10**

US faculty will also bring expertise in other specialties that are critical to the health system but have lower enrollment targets for students. Beginning in 2012, US faculty will also begin to work in oncology and psychiatry. Programs in emergency medicine, ear/nose/throat, neurology, radiology, pathology and orthopedics will start in 2013. A total of 77 US faculty members will work on these other specialties in Rwanda between 2012 and 2019.

Physicians currently serving as clinical mentors in Rwanda have received little to no training in education to date. While some have years of experience in clinical practice, they often do not provide optimal training for students in teaching hospitals. US mentors will be paired with these clinicians to provide mentorship, build technical capacity and evaluate students in a clinical setting. US mentors will regularly meet one-on-one with their Rwandan partner to discuss the students under their tutelage and different teaching strategies.

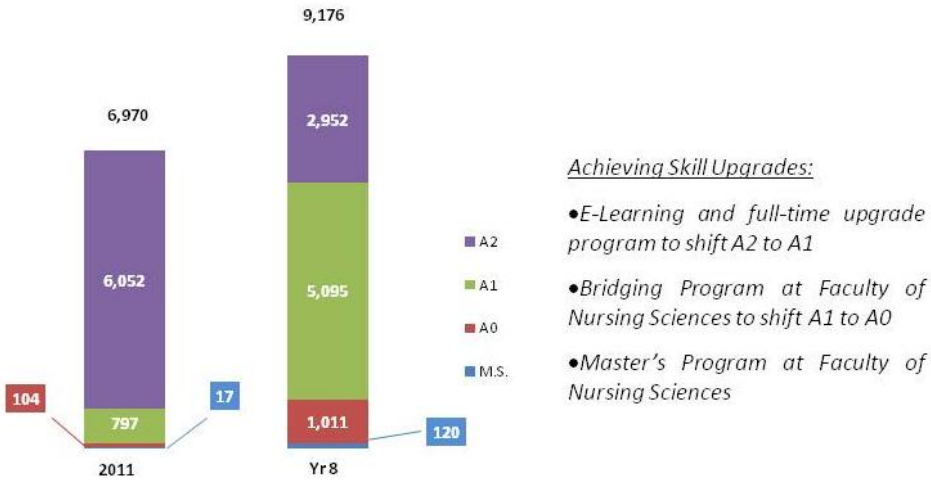
In addition to building capacity of existing faculty and mentors, new educators are urgently needed in specialty and subspecialty roles. New educators will come from the pool of new graduates from the postgraduate programs. Talented students will be identified as early as possible to be tracked as potential future faculty members. After an individual is identified as a potential faculty member, a contract will be drawn up, defining both the training process and commitment to and from the individual as a future faculty member. Individuals in this priority program will receive special attention and training, and will be obligated to remain as full-time faculty member for a pre-defined period in exchange.

2. Nursing and Midwifery

For nurses and midwives, the HRH Program is heavily focused on raising the skill level of the workforce. Historically, there have been three levels of training for nurses and midwives in Rwanda—A2, A1, and A0. A2 level nurses and midwives are trained to the secondary school level while A1 nurses and midwives possess an advanced certificate following three years of school. A0 nurses and midwives possess a bachelor's degree, and often become faculty members. Beginning in 2006, the Ministry of Health stopped training and deploying nurses and midwives of A2 level, deeming their skill sets insufficient to provide quality patient care. The minimum requirement for a Rwandan nurse is now A1. The HRH Program builds on the Ministry of Health's effort to upgrade the skill levels of existing A2 nurses and midwives, as well as dramatically increase the production of new A1 and A0 level nurses and midwives.

The Ministry of Health has developed educational pathways for nurses and midwives to advance from A2 to A1 to A0 levels in an efficient sequence, raising the overall skill levels of the nursing and midwifery cadre in the country. As shown in Table 4, a total of 4,298 A1 nurses and 907 A0 nurses will be trained through the HRH Program. In addition, the Government of Rwanda will dramatically increase the number of master's level nurses in Rwanda, from only 17 in 2011 to 120 by 2019.

Table 4. Skill level of nurses/midwives in the health workforce, 2012-2019



Through the HRH Program, the Faculty of Nursing Sciences (FNS) will develop post baccalaureate certificate/diploma programs in specialty areas, to begin enrolling students in 2013. Several nursing specialties are under consideration including surgical nursing, pediatrics and mental health. FNS will work with the Nursing and Midwifery Council to prioritize specialty training, set standards for certification and forecast the need for nurses with specific clinical knowledge and skills.

To reach the targeted improvements in the nursing workforce, the quality of teaching at the A1 Schools of Nursing and Midwifery will be significantly strengthened. By the end of 2019, the FNS Bachelor's of Nursing Education will graduate 140 new A0 Rwandan lecturers. A four-week certificate program for clinical mentorship will also be launched to improve the quality of clinical training for nursing and midwifery education. Through this program, 240 clinical mentors will receive certificates. Graduates of the program will spend 20% of their time mentoring, resulting in a total of 48 FTE clinical mentors. An additional 50 clinical instructors at FNS and the A1 Schools of Nursing and Midwifery will complete training in clinical mentorship. Finally, 103 nurses or midwives will complete a Master of Science in Nursing, creating a critical cadre of high-quality Nurse Educators.

To support the achievement of nursing and midwifery targets, faculty from the US Academic Consortium will send 229 FTEs over the course of the HRH Program. There will be 224 FTEs from 2012-2019 (Table 5) and an additional 5 FTEs through the Planning Phase (see Appendix 3 for further information). US faculty members will engage in four strategic areas: national-level nursing support, A0 & master's level nursing education, A1 nursing and midwifery education, and clinical nursing mentorship. US clinical mentors will be assigned to teaching hospitals throughout the country. Mentors will also serve as a resource for FNS and the 5 A1 Nursing and Midwifery Schools. They will provide lectures, faculty development programs, and advice on curriculum development in specialty areas.

Table 5. US Nursing and Midwifery Faculty, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
National-Level Nursing Support	4	4	4	3	2	1	0
A0 & Master's-Level Nursing Education	1	1	1	1	1	1	1
A1 Nursing & Midwifery Education	5	5	5	5	5	5	5
Clinical Nursing Mentorship	32	32	30	23	20	16	11
GRAND TOTAL: Nursing & Midwifery	**42**	**42**	**40**	**32**	**28**	**23**	**17**

3. Oral Health

The only oral health training program currently in Rwanda is at the Kigali Health Institute where students can obtain a degree in dental therapy. Dental therapists provide basic care and perform simple procedures. Their skills are limited, however, and they cannot treat more complicated oral health problems. For more advanced degrees, students must currently study abroad.

Through the HRH Program, the Ministry of Health plans to create a dental educational and training school geared towards graduating first-rate dental health professionals. The new School of Dentistry aims to train three levels of personnel through one unified training program:

Complete year one:	graduate with a Dental Assisting certificate (DA)
Complete year three:	graduate with a Dental Therapist degree (BDT)
Complete year five:	graduate with a Bachelor of Dental Surgery (BDS)

There are currently an insufficient number of trained faculty members to educate the targeted number of oral health professionals. As shown in Table 6, the target is to increase the number of oral health professionals from 122 to 424 by 2019. At present, all of the dental surgeons on the faculty in the Department of Dentistry are expatriates.

Table 6. Oral Health Professional Workforce, 2012-2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
Dental Assistant Program	1	1	1	10	28	51	74	97	120	119
Dental Therapy Program	105	105	132	168	193	213	233	253	273	168
Dental Surgery Program	10	10	10	10	10	10	10	14	18	8
Other*	6	6	7	8	9	10	11	12	13	7
DENTISTRY TOTAL	**122**	**122**	**150**	**196**	**240**	**284**	**328**	**376**	**424**	**302**

US faculty will be heavily engaged with their Rwandan counterparts to develop a new curriculum that offers three different degree options depending on interest, resources and entry level requirements. At present, Rwandan faculty members are adequately trained to teach most, but not all, coursework. US faculty will be needed to mentor existing Rwandan faculty and to fill gaps in capacity for selected curricular areas. The School of Dentistry estimates that eight full-time senior faculty (Rwandan and expatriate) are needed to execute the program. As the program graduates students, new Rwandan junior faculty will join and US faculty will phase out. Table 7 below shows that 2 US faculty members will build capacity at the School of Dentistry from 2012-2017 and then decrease to 1 FTE until the end of the HRH Program.

Table 7. US Oral Health Faculty, 2012-2019

2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
2	2	2	2	2	1	1

4. Health Management

There are only 7 individuals with any public health training in hospital management roles in Rwanda. The training opportunities for healthcare management are minimal and health management is not a well-developed profession in Rwanda or in the East Africa region. As a result, management capacity in hospitals is variable and often substandard.

Through the HRH Program, the School of Public Health aims to introduce two new degree programs: a Master in Hospital and Healthcare Administration (MHA) and a Certificate of International Health Management (CIHM). The MHA program will combine classroom-based work in management and leadership, with supervised field work to apply and refine these skills. Over the course of the HRH Program, the SPH aims to graduate 75 new managers from the MHA program, surpassing the minimum requirement needed to ensure that at least one trained health manager is working at each of the district, provincial, and referral hospitals by 2019 and that at least one trained health manager is working in each district health office. In the early stages of the MHA program, graduates will be assisted in placement at leadership positions within the health system. This will help to maximize their impact and position them to implement new skills.

In addition to the health managers themselves, there is a need to build management capacity among the senior management teams at hospitals and district health units. The Certificate in International Health Management (CIHM) program will be established to meet the needs of this group. It will use a team-based approach that will be directly applicable to their organizations. These management teams will be enrolled as cohorts, including administrators, heads of clinical departments, chief nursing officers at the hospital level, officers in charge of health centers (chargés de santé), and their teams in the district offices. The CIHM will build similar skills as the MHA but will be geared toward experienced professionals. This will allow for a more intensive and shorter-term training program. Table 8 below provides the workforce targets for the CIHM and MHA programs by the end of the HRH Program.

Table 8. Health Management Workforce Targets, 2012-2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 19)
CIHM	0	0	0	0	15	30	45	60	75	75
MHA	7	7	7	7	22	37	52	67	82	75
TOTAL	**7**	**7**	**7**	**7**	**37**	**67**	**97**	**127**	**157**	**150**

Many of the modules in the MHA and CIHM programs can be taught by existing faculty at the School of Public Health. Therefore only a limited number of expatriate faculty members will be required for classroom teaching. However, Rwanda is lacking skilled on-site mentors to work with management students in the health facilities. To fill this gap, 6 full-time equivalent (FTE) US faculty members are needed to provide hands-on mentoring, as well as some classroom teaching (Table 9). There will be 4 expatriate

faculty based full-time in Rwanda with 2 rotating positions for specified areas. Faculty members from the US Academic Consortium will be in place from 2012 – 2014, phasing out completely by 2015.

Table 9. US Health Management Faculty, 2012-2019

2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
6	6	4	0	0	0	0

The health management program will use mentoring to build management and leadership capacity at the hospital level. Mentors will also provide support to the interdisciplinary teams enrolled in the CIHM program. Students enrolled in the MHA and CIHM program will spend 75% of their time at on-site training. During this time, mentors will lead them in development of skills such as individual management and leadership capacity, organizational culture, and hospital operations.

Building capacity for mentoring within Rwanda for the newly formed health cadre of health management will require long-term investment. In addition to existing Rwandan faculty who will be involved in the MHA and CIHM programs, the SPH requires two additional full-time Rwandan faculty mentors. These positions will be paid for by the SPH and not through the HRH Program. The Health Management Program Coordinator will work to identify strong existing managers in the healthcare system to take mentorship roles, including potential mentors from the private sector. Graduates of the MHA program will also be recruited to act as mentors.

B. Establish high-quality clinical training sites and schools

High-quality health professionals must be trained in settings that provide high-quality care. In these settings, clinical mentors can teach by example and students complete supervised rotations with clinical mentors to learn how to provide care to patients. However, most of these sites currently lack the basic equipment and infrastructure needed to train students to provide high quality care. Significant infrastructure and equipment upgrades will be required to improve the level of care and instruction provided.

To accommodate the increased enrollment of students through the HRH Program, the Ministry of Health needs to increase the number of clinical training sites where students rotate. As an example, the clinical training sites for internal medicine are provided in Table 10 below. Each hospital has a capacity to absorb a certain number of postgraduates. As student enrollment increases, the number of clinical training sites needs to also increase.

Table 10. Clinical Training Sites for Internal Medicine with numbers of students per site, 2011-2019

Specialty	Teaching Hospital	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Internal Medicine	Faisal	3	4	6	6	6	6	6
	Kanombe	3	4	5	5	5	5	5
	CHUK	10	10	10	10	10	10	10
	CHUB	8	8	8	10	10	10	10
	Rwamagana (PH)		5	5	5	5	5	5
	Ruhengeri (PH)		5	5	5	5	5	5
	Kabgayi (PH)			5	5	5	5	5
	Kibagabaga (PH)			5	5	5	5	5
	Gihundwe (PH)				5	5	5	5
	Rwinkwavu	4	4	4	4	4	4	4
	Butaro							
	Hospital Capacity	**28**	**40**	**53**	**60**	**60**	**60**	**60**
	Student Enrollment	**33**	**47**	**55**	**60**	**60**	**60**	**60**

For oral health professionals and health managers, the launch of new programs will provide a clean slate to develop rigorous on-site training components. Whenever possible, physicians, nurses, oral health professionals and health managers will be trained in the same teaching hospitals to foster team-based learning. Enhancement of training sites not only strengthens the education of students but also fosters opportunities for the continuing professional development (CPD) of practicing healthcare workers.

For all of the cadres in the HRH Program, the Ministry of Health selected 12 hospitals for upgrades; 9 will be used for physician specialty training, all hospitals will be used for nursing and midwifery, and 6 hospitals will be used for oral health education (Table 11). Sites were selected based on patient volume and staff capacity to support education programs. For nursing and midwifery, 3 District Hospitals and 2 Provincial Hospitals were selected to be upgraded due to their proximity to A1 Schools of Nursing and Midwifery. The 5 nursing schools, the School of Dentistry, the School of Public Health, the Faculty of Medicine and the School of Nursing Sciences will also be upgraded to support the objectives of the HRH Program. These upgrades range from building classrooms to supporting an increased number of students, expanding libraries and access to educational resources, to procurement of essential equipment. Table 11 below outlines the numbers and levels of hospitals that will be upgraded through the HRH Program, as well as the number per health cadre program.

Table 11. Hospitals and Schools Upgraded through the HRH Program[4]

Hospital Upgrades	Referral	Provincial	District	TOTAL
Physicians	4	5	2	11
Nursing & Midwifery	4	5	3	12
Oral Health	1	4	1	6
School Upgrades				**TOTAL**
Schools				9
Faculty of Medicine				1
A1 Schools of Nursing and Midwifery				5
School of Public Health				1
School of Dentistry				1
Faculty of Nursing Sciences				1

C. Accelerate recruitment and support student retention

The HRH Program aims to rapidly build a critical mass of skilled health workers and health educators. To reach these goals, each educational program will promote recruitment into programs that increase skills and specialization of health workers. The following strategies will be implemented:

1. **Improve the quality of education.** The primary strategy to recruit and retain a critical mass of students is to dramatically improve the quality of education programs by investing in human resources and infrastructure. Students will be more likely to pursue degrees in programs that are adequately staffed with people who provide knowledge and skill-sets of the highest caliber. Furthermore, if students recognize that they will receive their education in schools and clinical training sites with sufficient infrastructure and equipment, they will be more likely to enroll and remain in training until graduation. The combination of investments in human resources and infrastructure and equipment create an enabling environment for learning and tangible acquisition of skills.

2. **Provide student support.** The Ministry of Health will provide students with support for room and board during their education. Undergraduate students at the Faculty of Medicine, students of nursing and midwifery, students at the School of Dentistry, and health management students will be eligible for stipends during portions of their training. In addition, teaching hospitals will be able to provide transportation support to residents, easing the financial and logistical burden on students. The provision of support will ease economic burdens on students, allowing them to focus wholeheartedly on excelling in their educational endeavors.

[4] There are three levels of hospitals in Rwanda: referral, provincial and district. Typically, referral hospitals provide specialty and subspecialty care, provincial hospitals provide some specialty care and district hospitals provide basic patient care.

3. **Provide flexible degree options.** Health education programs have been designed with a flexible approach, to encourage students to enroll and to increase the likelihood that they will complete the program. For example, students applying to the School of Dentistry will have the opportunity to select their desired degree track. During the course of study, students who originally planned to graduate earlier in the program have the option to stay in the program longer and graduate with a higher-level degree. Additionally, students who are unable to meet their original intended goal for graduation can graduate earlier with a different degree. These students will be eligible for re-entry to obtain a more advanced degree at a later time. This option allows all students who enter the SOD the opportunity to graduate with marketable skills.

   The e-learning program for nurses and midwives is a strong example of the Government of Rwanda's approach to facilitating skill upgrades in health workers in a manner that will maximize recruitment and retention of trainees. The e-learning program is designed to adapt to the learning needs of nurses and midwives who are already working, but who are in need of further training. The curriculum design is catered to these stipulations, making the program attractive to these targeted candidates and making it highly likely that they will successfully graduate. Similarly, the health management program at the School of Public Health seeks to encourage enrollment of existing health workers who are in positions that require management training. While they are enrolled in the CIHM certificate program, they will be supported to continue their responsibilities, and will be able to return to these positions with a highly-applicable skill-set at the conclusion of the program.

4. **Target outreach to women.** Concerted effort will be made to improve the recruitment and retention of female undergraduate medical students and postgraduates. Of the 586 undergraduate medical students in Rwanda, only 125 are Rwandan females, and even fewer postgraduates are female. According to the female physicians at CHUK, one of the main barriers to women entering the field of medicine is a medical education system that does not cater to cultural practices. The intensive years of unpaid study, demanding schedule of doctors, and posts outside Kigali are not conducive to women having a family, as women are the primary caregivers in Rwanda. Another problem is that girls have historically been underrepresented in the sciences in secondary school, leading to low medical school enrollment. While this has been improving with the introduction of all-girl secondary school science programs, cultural expectations still do not favor girls in the sciences, and careers in scientific fields are often not seen as an option.

   The Ministry of Health aims to increase the number of women in medicine through a campaign using female role models to recruit trainees, and by adjusting benefits and schedules in hospitals to accommodate mothers. To encourage more female undergraduates at the Faculty of Medicine to pursue specialty training, the Ministry of Health will waive the 2-year requirement to serve in a District Hospital after graduation, allowing female students to enroll directly into postgraduate specialty studies. Refer to Appendix 10 for further detail about this strategy.

D. Implement integrated, competency-based curricula

Development of high quality health professionals will require curricula assessments and possible upgrades across all health cadres. Curricula will have standard elements, principally an emphasis on on-site learning, a focus on cross-disciplinary integration across cadres, and the establishment of competency-based evaluation processes. Furthermore, high-quality curricula for each cadre will meet the following objectives:

- Equip trainees with the full body of knowledge and technical skills to be high-performing members with their respective health cadre;
- Meet international standards;
- Adhere to Ministry of Health and Government of Rwanda policies and procedures.

The status of curricula in each cadre currently varies. Existing curriculum review committees will be incorporated into Health Cadre Sub-Groups. Groups of senior faculty in each program area will provide technical expertise for programmatic review. The collaborative curricula development process will foster ownership and accountability for implementation by health educators and program managers. The HRH Program will maximize opportunities to streamline and harmonize curricula content and methodology across disciplines.

1. Strengthen on-site learning

Each health cadre will prioritize practical application of skills within its curriculum, applying hands-on methods of learning to help students apply and retain didactic lessons, and make them better equipped to practice once they are deployed into the field. For physicians and nurses/midwives, the bulk of the learning for trainees will occur at the bedside, through clinical mentoring and supervision by experienced clinicians. This type of supervised exposure to patients helps to translate the lessons learned in the classroom into optimal clinical practice and professional behavior. Similarly, health management students will spend 75% of their time in on-site mentoring. Students at School of Dentistry will also devote significant time to hands-on learning.

While a clear emphasis across each specialty will be to increase, strengthen, and diversify hands-on clinical or practical training, curricula will require a mix of teaching methods. Lectures, bedside teaching, simulation exercises, case conferences, and self-directed learning have complementary roles in health education, and a balance of each will be employed to meet the defined learning objectives of each curricular module.

2. Interdisciplinary education

As in most of the world, healthcare in Rwanda is organized into – and therefore delivered through – silos of care. However, a growing body of evidence in the field of health education suggests that cross-disciplinary integration is not only valuable for the efficient use of resources, but also provides important opportunities for health professionals to share the strengths of their respective disciplines, ultimately resulting in higher quality, more comprehensive patient care. The Rwandan health education system is now well poised to incorporate in its revised educational system these cutting edge innovations in health education.

During the curricula review and revision process, subject matter that can be taught to all health professions' students will be identified. Cross-disciplinary topics will be integrated into classroom and on-site training. At health facilities, interdisciplinary teams will be organized for training as much as possible. See Appendix 9 for more information on the importance of interdisciplinary education within the Rwandan educational system.

A core group of faculty focused on integrated training will be established, comprised of members of each Health Cadre Sub-Group. The Interdisciplinary Integration Committee will identify opportunities for interdisciplinary education (see Appendix 9). For the first two years of the HRH Program, a member of the US Academic Consortium will partner with the Chairperson of the Pedagogy Committee at the Faculty of Medicine and the Vice-Rector for Academic Affairs of RUMHS to lead the effort to implement a health education program in Rwanda that promotes cross-disciplinary linkage. This US faculty member will phase out after two years.

3. Evaluations

Each cadre will develop an objective review process within the curriculum that measures the competencies of students, as well as provides a mechanism to evaluate the effectiveness of teachers and trainers. Students will be evaluated on mastery of both knowledge and skills relevant to their cadre, and evaluation methods will reflect the need to demonstrate thorough understanding of both the information and practical application of each training module.

The implementation of a strong system for ongoing assessment of applied skills will allow for a more informed and precise review of trainees' progress. Evaluation will include a baseline analysis of each student to identify, discuss, and strategize individual clinical strengths and weaknesses. This method will ensure critical targeted intervention and remediation throughout the course of training. As curricula are revised by Health Cadre Sub-Groups, evaluations will be modified to reflect the constantly evolving nature of health worker education. As the HRH Program progresses and the quality of education increases students will ultimately be evaluated in accordance with international standards, with rigor and stringency comparable to those in the US.

E. Increase the importance of teaching and careers in health professions

A major barrier to delivering high quality health education is that there are too few experienced health professionals who are actively teaching as part of their clinical practice. The HRH Program aims to create a culture within health cadres in which teaching and mentoring roles are valued, where more senior healthcare professionals tutor less experienced colleagues and students. The increase in the number of faculty and mentors in each health cadre, and the improvement in their teaching skills, will allow for the training of a greater number of quality health professionals. Leadership from the Ministry of Health will ensure that highly skilled health professionals with roles as faculty are not only encouraged to teach, but are held accountable for their teaching responsibilities, closing the current gap between teaching expectations and actual practice.

1. Shift management and administrative duties

Many faculty members report that they are overburdened by management and administrative duties. A lack of effective management within teaching institutions and hospitals contributes to this problem. Through the development of the Health Management program that will offer both a Certificate in Health Management and a Masters in Hospital and Health Care Administration (MHA), capacity for effective organizational management will improve significantly. While these programs develop, there will be simultaneous efforts to restructure teaching institutions to lead to more effective management and a decrease in the haphazard overburdening of teaching faculty and mentors.

Through the HRH Program, Administrative Support Officers will be hired to support each postgraduate residency program at the Faculty of Medicine, the Faculty of Nursing Sciences, each A1 School of Nursing and Midwifery, the School of Dentistry, and the School of Public Health. The Administrative Support Officers' role will be to reduce the administrative burdens on faculty (see Appendix 12). This will allow faculty to allocate this additional time to classroom teaching, research, and program development without sacrificing patient care.

2. Career laddering

A clear career ladder exists for faculty at the Faculty of Medicine whose principal responsibility is teaching. However, there are clinicians who teach students at teaching hospitals but do not have a faculty appointment. One of the objectives through the HRH Program is to increase the number of clinical mentors who are formally given appointments in the Faculty of Medicine, these instructors must be included in this career development pathway, with adjustments to account for their clinically-centered role. This improved career advancement pathway will tie academic and educational achievements, in addition to clinical service, to promotion and compensation. Clear opportunities for recognition of excellence through promotions or award programs will provide tangible incentives for clinical mentors to invest time and effort into their training activities. This system will also make teaching roles more attractive to potential recruits and more prestigious in hospitals.

Work to define career laddering within each health cadre will be led by each Health Cadre Sub-Groups. Health Cadre Sub-Groups will also review current faculty terms of reference, to adjust where necessary for additional time dedicated to teaching and training activities. Following the necessary policy changes within the Ministry of Health, the new career laddering system will be implemented during the first academic year of HRH Program in 2012.

F. Build Institutional Capacity for Health Education

A principal approach of the HRH Program is to build the national institutional capacity necessary for high-quality health education to increase the number and skill level of the health workforce. The financial and human resource investments provided through the HRH Program will be systematically phased out as capacity is built in Rwanda. At the end of eight years, the HRH Program will be programmatically and financially sustained by Rwanda.

If funding for the HRH Program is awarded, a Planning Phase will start as soon as funding is released. The Planning Phase will focus on building institutional capacity to support the HRH Program. The first critical step will be the establishment of bodies for program oversight and strengthening existing structures for financial oversight. For programmatic oversight, the HRH Steering Committee will be formed. This group will be made up of academic and policy leadership from the Ministry of Health and academic institutions. The Steering Committee will oversee the academic and clinical components of the HRH program. Within the Ministry of Health, a group of programmatic personnel will assist with monitoring and evaluation, program management, administration, and logistics (Appendix 12). The Single Project Implementation Unit (SPIU) of the Ministry of Health will provide financial management of the HRH Program. The SPIU will recruit new staff into the Unit's existing structure to manage program funds. The SPIU and the MoH will develop a regular meeting schedule to coordinate and align programmatic activities with financial needs. For example, the SPIU and the Health Cadre Sub-groups will coordinate teaching hospital upgrades with the implementation schedule of new postgraduate programs. The establishment of these processes for coordination between financial and programmatic units will strengthen program management and implementation within the Ministry of Health.

Through the HRH Program, regulatory institutions will also be strengthened. A member of the US Academic Consortium will partner with the Nursing and Midwifery Council to help establish regulatory procedures such as licensing exams and school accreditation. After three years, US faculty support for the Nursing and Midwifery Council will phase out, and the Council will be well-equipped to perform regulatory functions for Rwandan nurses and midwives. Health Management and Oral Health will require significant investment at the institutional level to ensure that these new educational programs are built with strong foundations that will lead to long-term sustainability.

US faculty will partner with Rwandan educational institutions to help build the systems necessary for ongoing program management. Support will be most intensive during the Planning Phase but will transition out completely by the end of implementation in 2019. A detailed explanation of the Planning Phase, which will focus on building a national-level foundation for sustainable health education within the Ministry of Health and associated institutions, is provided in Appendix 3.

G. Expand research partnerships and academic exchange

Rwandan health professional students currently receive limited training in research methodology. There is also limited infrastructure for clinical research in Rwanda. Nonetheless, training and expertise provided through the School of Public Health has built some research capacity in Rwanda. Rwandan medical researchers are active in many fields, and have a strong track record in national and regional publications such as the *Rwanda Medical Journal*, the *East African Medical Journal* and the *East African Journal of Public Health*. Rwandan researchers remain underrepresented, however, in major international journals.

The Government of Rwanda recognizes the importance of research in improving clinical practice, informing health programs and sharing knowledge generated in the Rwandan health sector with an international audience. The ability of Rwandan faculty to participate in

research and publications jointly with US universities will stimulate scientific thought and innovative problem-solving. Through the HRH Program, the Health Sciences Research Center will be established to support Rwandan faculty and students to pursue research opportunities. The Center will connect international researchers with Rwandan researchers, help Rwandan researchers to develop grant proposals and secure funding, and provide statistical and administrative support to research projects as needed.

US faculty will be encouraged to build research capacity at the Health Sciences Research Center. These faculty mentors will share knowledge and experience with their Rwandan counterparts on research methodology and the publication process. As research capacity develops in Rwanda, academic and clinical institutions will further develop formal research training and opportunities. While Rwandan faculty are currently evaluated on the number of academic publications generated, other measures of research quality and impact should also be considered, such as the impact factor of the journals in which they have published. Mentorship teams will be strengthened by the mutual incentive of the faculty: research is a key factor for both Rwandan and US faculty members' promotion and prestige.

In addition to in-country mentorship, the HRH Program will support Rwandan participation in international scientific forums, funding exceptional clinician-scientists to attend and present research at scientific conferences. While the funds to conduct research will not be included in the scope of the HRH Program, US faculty will mentor Rwandan counterparts in how to prepare grant proposals to access funding through various external bodies (e.g. National Institutes of Health). Detailed information on the research component of the HRH Program can be found in Appendix 11.

VI. Monitoring and Evaluation

The scope, ambition, and innovative nature of the HRH Program requires rigorous and ongoing Monitoring and Evaluation (M&E). The program's success will be measured according to the program goals. Notably, formative evaluation will also be conducted annually to assess the HRH Program's progress towards these goals and, most importantly, to identify any areas of work that require attention and course-correction as the project is implemented.

The Government of Rwanda will analyze findings from the program's formative evaluations to allow USG and other partners in global health to identify important 'lessons learned' from its innovative approach. Findings and analyses will provide evidence for other countries or entities seeking to replicate and/or assess the relative value of the HRH Program's technical approach and strategy.

Table 12 provides an overview of the measures by which the HRH Program's success and progress will be assessed.

Table 12. Outcome Evaluation Measures for Core Project Goals

Overall aim of the HRH Program: ***Build a sustainable, high-quality health workforce capable of providing the citizens of Rwanda with a world-class level of healthcare***	
Goal 1a. Increase the number of physicians overall from 633 to 1182	
Indicators	• Number of new doctors • Ratio of medical doctors per 10,000 inhabitants, by Province
Goal 1b. Increase the number of specialists from 150 to 551	
Indicators	• Number of specialists, by specialty and % of total doctors who are specialists • Ratio of female specialists to specialists overall and by specialty
Goal 2a. Increase the overall number of nurses and nurse/midwives from 6,970 to 9,178	
Indicators	• Number of new nurses and midwives • Number of A1 or higher level nurses per 10,000 inhabitants, by Province • % of health facilities with a midwife per 3,000 inhabitants, by Province
Goal 2b. Increase the overall skill level of nurses by increasing the number of nurses with A0 credentials from 104 to 1,011 and the number of nurses with A1 credentials from 797 to 5,095, and the number of Masters-level nurses from 17 to 120	
Indicators	• % A0 nurses of total nurses/midwives • % A1 nurses of total nurses/midwives • % Masters-level nurses of total nurses/midwives
Goal 3. Introduce the role of 'health manager' into the Rwandan health system and increase the number of trained health managers from 7 to 157	
Indicators	• Number of new health managers by degree program • Number of individuals in management roles at hospitals/healthcare centers that complete a health management degree program • % of hospitals managed by a trained health management professional
Goal 4. Launch the School of Dentistry, and increase the number of oral health professionals from 122 to 424	
Indicators	• Number of new oral health professionals by degree program • Ratio of dentists per 10,000 inhabitants, per Province
Goal 5. Create teaching hospitals and medical, nursing, oral health and health management schools that have the infrastructure, equipment, and institutional capacity to sustain high quality health education	
Indicators	• Monitoring and evaluation for this project goal will occur through formative evaluation measures, below

Each area of the HRH Program's technical approach will be evaluated based on key indicators, outlined in Table 13.

Table 13. Formative Evaluation Measures

1. Increase skill levels and specialization of healthcare professionals and educators	
Physician Indicators	• Number of specialists in Rwanda per year, by specialty • Number of postgraduates per year sent abroad for subspecialty training • Number of new specialist and subspecialist faculty • Number of US-Rwandan mentor partnerships per year by specialty
Nursing and Midwifery Indicators	• Number of A1 level nurses/midwives in Rwanda per year • Number of A0 level nurses/midwives in Rwanda per year • Number Master's-level nurses/midwives in Rwanda per year • Number of nurses and midwives completing Certificate Program • Number of A0 nursing and midwifery faculty per year • Number of master's-level nursing and midwifery faculty • Number of nurses and midwives trained as Clinical Mentors
Oral Health Indicators	• Number of students completing the Dental Assisting program per year • Number of students completing the Dental Therapist program per year • Number of students completing the Bachelor of Dental Surgery program per year • Number of new Rwandan dentistry mentors per year
Health Management Indicators	• Number of individuals who graduate from the MHA program • Number of teams who complete the CIHM program per year • Number of US faculty placed in mentorship roles per year • Number of Rwandan faculty teaching in MHA and CIHM programs per year • Number of mentors established per year
2. Establish high-quality clinical training sites and schools	
All Programs	• Number of targeted clinical training site upgrades completed by program per year • Number of schools upgraded per year
3. Accelerate recruitment and support student retention	
Indicators	• Number of individuals enrolled in each degree program per year • Number of individuals who complete each degree program per year
Indicators for Female Health Professionals	• Ratio of women undergraduate medical students to overall number of undergraduate medical students per year • Ratio of women postgraduate specialty trainees to overall number of postgraduate specialty students by specialty per year • Number of women-women mentors pairs at Undergraduate and

	Postgraduate levels per year • Number of women health managers • Number of women dentists
4. Implement integrated, competency-based curricula	
All Programs	• New curricula drafted per health cadre • Curricula review completed biannually • Level of cross-disciplinary integration in classroom and training settings • New evaluation mechanisms drafted and implemented per health cadre
5. Increase the importance of teaching and careers in health professions	
Indicators	• Ratio of students to educators at each school per year • Number of schools with Administrative Support Officers in place
6. Build institutional capacity for health education	
Indicators	• HRH Steering Group Established and meeting according to schedule • Program Support Unit and Health Cadre Sub-Groups established with annual work-plans created • SPIU staff hired with HRH-specific responsibilities • M&E system in place collecting and analyzing program data on regular schedule
7. Expand research partnerships and academic exchange	
Indicators	• Number of active US-Rwandan research partnerships per year • Number of Rwandan investigators with external research funding per year • Number of Rwandan journal publications per year

A. Monitoring and Evaluation Resources and Processes

The HRH Steering Committee will take the lead on the development of all M&E tools, instruments, and methodologies. The Planning Phase (further detailed in Appendix 3) will include meetings dedicated to finalizing the M&E approach. M&E progress will subsequently be reviewed at each Steering Committee meeting in order to ensure that all relevant emerging findings are incorporated into the work of the project and that the M&E procedures are updated and revised as necessary. An expert with proven M&E experience in similar large-scale development programs will be recruited to coordinate M&E for the HRH Program. He/she will participate in all Steering Committee meetings focused on M&E to ensure that best practices and rigorous methodologies are integrated into the project. He/she will also be paired with a dedicated M&E Coordinator within the SPIU who will manage M&E for the HRH Program.

M&E activities will build upon data collection and management tools already in place within the Government of Rwanda. Currently, the Ministry of Health relies upon the District Health Systems Strengthening Tool (DHSST) to collect and track data that is then used to monitor and improve existing Human Resource Development (HRD) initiatives and other Ministry of Health programs. To date, the DHSST provides information from District Hospitals only.

Under the auspices of the HRH Program, the DHSST will be expanded to Provincial and Referral Hospitals, encompassing all hospitals in Rwanda.

Finally, two other important data collection initiatives currently in the planning stages at the Ministry of Health will also help gauge the effectiveness of the HRH Program. The first is the system now being developed to collect and organize the data Rwanda needs to apply for regional accreditation for its national hospitals (King Faisal Hospital is the only hospital that is currently accredited). The second is the Ministry of Health's Performance Based Financing (PBF) system, which thus far has provided incentives to hospitals to meet selected health service provision targets. To reinforce the HRH Program's goals of hands-on clinical training, the Ministry of Health will expand the PBF system to include incentives for clinical mentorship at both the hospital and individual physician level.

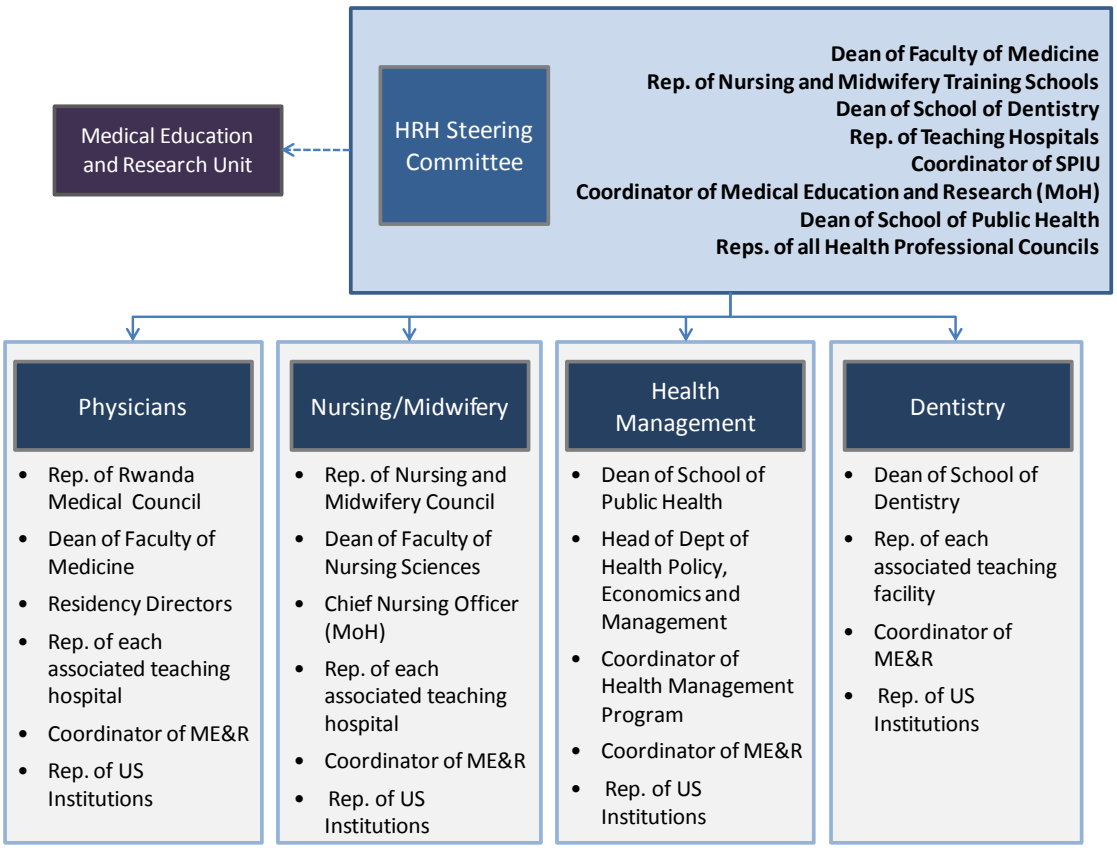
VII. Management and Financial Oversight

The HRH Program Steering Committee will provide leadership and guidance for the HRH Program and all related health sciences education initiatives in Rwanda. The Single Project Implementation Unit (SPIU) will ensure that sound financial and administrative management backs up all project activities. The work of both is described in more detail below. A high-level overview of the disbursal of project funds from the Government of Rwanda to the various entities responsible for carrying out HRH Program activities is also provided.

A. Program Management and Coordination

Figure 2 describes the relationships and reporting arrangements between the various bodies charged with providing leadership and guidance for all HRH Program efforts:

Figure 2. Coordinating Bodies for the HRH Program



The HRH Steering Committee is the central leadership body that will help to define the overall strategic vision for Rwanda's world-class health education. Oversight of and guidance for the programmatic work of the project will be provided by Health Cadre Sub-Groups, each of which will report in to the HRH Steering Committee. The Medical Education and Research Unit (ME&R) within the Rwandan Ministry of Health will be reinforced with additional dedicated staff in order to provide programmatic support for all HRH Program efforts. More details regarding the specific work of the units reporting to the HRH Steering Committee are provided in the table below. Additional information about the organizations represented within Sub-Groups is provided in Appendix 13.

Table 14. Responsibilities of Affiliated HRH Program Units

HRH Program Unit	Responsibilities and Representation
HRH Steering Committee	The HRH Steering Committee will provide leadership and programmatic guidance for all HRH Program activities. Specific responsibilities include the following: • Oversee and guide the work of the Director of Human Resource Development at the Ministry of Health as it pertains to the HRH Program. • Select, approve, and invite all foreign academic institutions to provide technical assistance and capacity building of physicians, nurses, oral health professionals and health managers

	• Assess progress against HRH Program targets for training institutions and teaching hospitals • Receive regular reports from Health Cadre Sub-Groups on the status of teaching faculty, teaching infrastructure, and student progress • Provide general guidance to the Sub-groups for physicians, nurses and midwives, health managers, allied professionals, and teaching hospitals • Assess validity of and authorize requests to study abroad for specialized training
HRH Program Support Unit	The HRH Program Support Section will provide program administrative support for all HRH Program activities. Specific responsibilities include the following: • Coordinate the set-up of the Steering Group and the four Sub-Groups during the initial start-up of the project, and providing hands-on administrative assistance to support the work the various groups involved in the HRH Program as their staffing is getting up to speed; • Organize meetings and take and publish notes for the Steering Group and each of the Health Cadre Sub-Groups; • Facilitate communication and collaboration between the Sub-Groups; • Coordinate all M&E activities, including support for thorough record-keeping by Sub-Groups and their members to ensure data is robust.
Health Cadre Sub-Groups	Each Health Cadre Sub-Group will include representation from key Rwandan institutions, teaching hospitals, and the US Academic Consortium. • Physicians. The Physician Sub-Group will oversee the undergraduate and postgraduate programs. The Physician Sub-Group will lead coordination efforts within each specialty group and will also facilitate communication between residency programs. Additionally, the Physician Sub-Group will be responsible for reviewing and approving the curricula of each residency program, issuing recommendations for a career laddering strategy, and defining a framework for development of new faculty and mentors. • Nursing and Midwifery. The Nursing and Midwifery Sub-Group will provide leadership and guidance for existing and new programs, drawing upon initiatives and structures already in place. The Sub-Group will focus on program development and the strategy to build capacity of nurse and midwife educators. • Health Management. The Health Management Sub-Group will provide guidance for the Rwanda School of Public Health to develop a joint program for the training of health managers to manage hospitals and health centers within the Rwandan

	health system. The Sub-Group will be focused on program development, as well as the long-term strategy for deployment and integration of this new cadre of trained managers into the Rwanda health system. • Oral Health. The Oral Health Sub-Group will provide guidance for the establishment of the School of Dentistry under RUMHS and the development of three critical dentistry degree programs in Rwanda. The Sub-Group will focus on establishment of School of Dentistry within RUMHS, including a long-term strategy for faculty development, introduction of new degree programs, and the deployment strategy for graduates and mentors

The Steering Committee will meet quarterly, phasing to once every six months thereafter. Additional meetings will be called as needed. Health Cadre Sub-Groups will meet monthly during the Planning Phase, scaling down to quarterly for the remainder of the program.

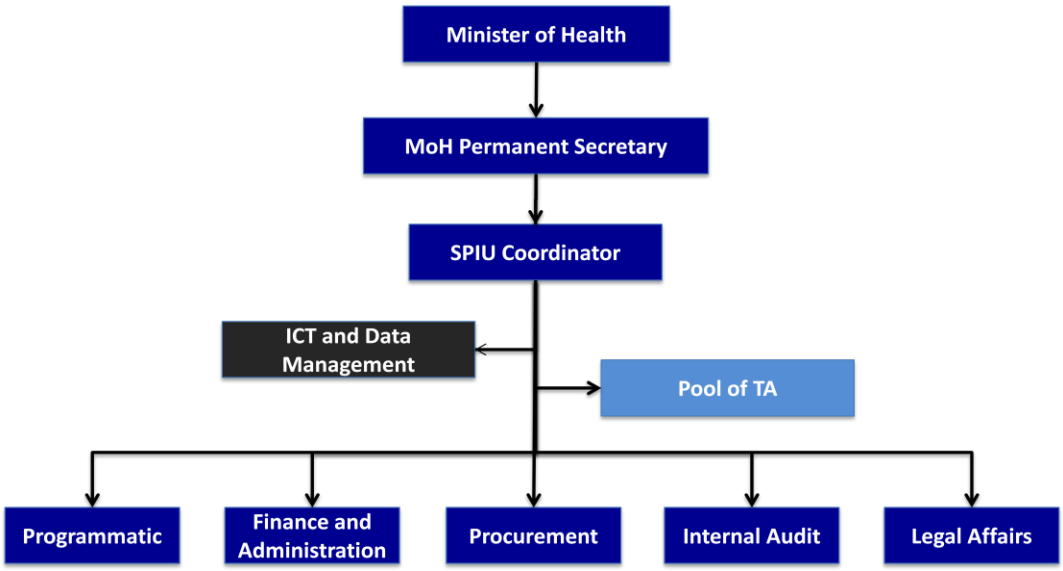
1. Financial Oversight

As part of the *Rwanda Aid Policy* endorsed by Rwanda's Cabinet in 2006, the Government of Rwanda established a Single Project Implementation Unit (SPIU) within each of the Rwandan Ministries to centralize the programmatic, financial, and administrative management functions associated with the implementation of project-based external funding. Subject-area experts such as engineers and pharmacologists are also located within the SPIU to provide guidance on work common to many foreign aid projects, such as renovation/construction efforts and the provision of ARVs and other drugs. The SPIU model expedites progress towards project goals by reducing the time typically spent on recruiting for new financial/administrative and program manager positions. The model also limits staff turnover and the associated loss of knowledge and skills. The ultimate aim of the SPIU is to hold the Government of Rwanda accountable to its citizens and to the external partners who have made commitments towards the country's development.

The SPIU within the Ministry of Health will be accountable for the management and oversight of all funds associated with the HRH Program and for ensuring compliance with all USG rules and regulations.

Figure 3 depicts the internal structure of the SPIU within the Ministry of Health. As outlined, the SPIU functions under the direct oversight of the Permanent Secretary of the Ministry of Health and carries out its responsibilities via five operational units: Programmatic; Finance and Administration; Procurement; Internal Audit; and Legal Affairs. The SPIU also manages a pool of Technical Assistance (TA) and an ITC and data management team, all of which are leveraged according to the needs and requirements of a particular project. Given the complexity and anticipated volume of work associated with the HRH Program, the SPIU will add five full-time staff to support the project.

Figure 3. Internal Structure of the SPIU



The following table provides a brief summary of each SPIU operating unit's role in ensuring efficient and effective management of the HRH Program:

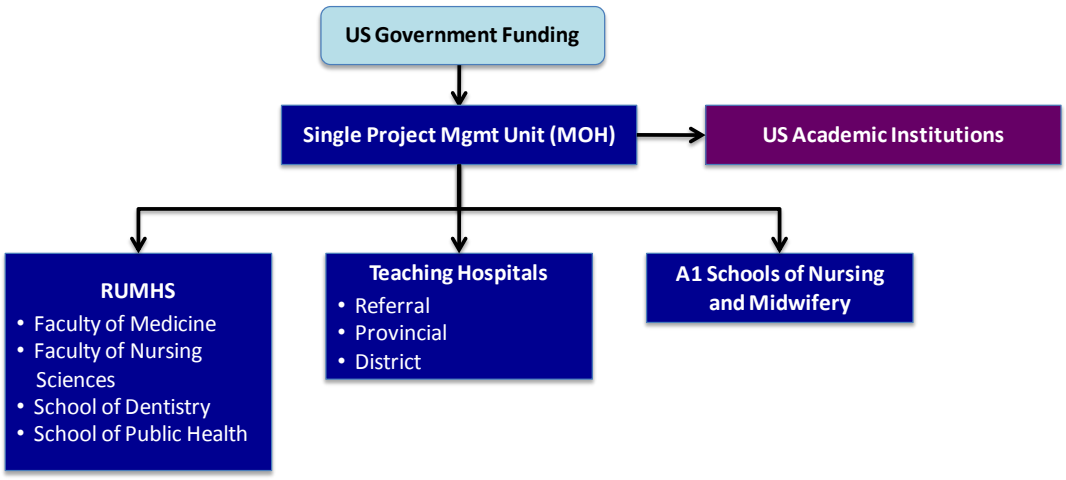
SPIU Operational Unit	HRH Program Responsibilities
Programmatic	• Produce timely reports on HRH Program implementation and progress for the GoR and the USG • Provide regular supervision for all USG sub-recipients and partner units within the GoR, including: 1) monitoring compliance with sub-recipient agreements, partner MoUs, and USG rules and regulations; and 2) identifying key challenges and making recommendations for improvement and/or technical assistance • Coordinate M&E activities
Finance and Administration	• Provide oversight of all payments and disbursal of funds to ensure compliance with USG cost principles and associated rules and regulations • Ensure that accurate and complete documentation is maintained in support of all payments and disbursal of funds • Liaise with the USG on disbursal of project funding by the USG • Produce timely and accurate financial reports for the GoR and the USG • Contribute to the development of annual budgets and periodic budget re-forecasts • Contribute to the annual audit of the HRH Program, as well as to any additional assessments required by the USG
Procurement	• Development of an annual procurement plan for review and approval by the GoR and the USG, including procurement of equipment necessary for teaching and training activities • Ongoing supply chain management to ensure that all teaching and clinical sites have the materials they need to fulfill their

	responsibilities • Prepare tenders, evaluate bids, and maintain supporting documentation per USG rules and regulations for procurement • Lead all renovation/construction associated with infrastructure upgrades • Produce reports on procurement activity for the GoR and the USG
Internal Audit	• Conduct annual audits of all partner units within the GoR to ensure their compliance with USG rules and regulations and the terms of their MoU • Review audit reports provided by US sub-recipients and follow up on any findings • Provide leadership for the annual audit of the overall HRH Program, as well as for any additional assessments of the project required by the USG • Develop and follow up on any Corrective Action Plans needed
Legal Affairs	• Contribute to the development of and provide final approval for all sub-recipient agreements and MoUs • Review and approve all procurement contracts and similar documents • Provide general legal support and counsel for all HRH Program activities.

2. Flow of HRH Program Funding

Figure 4 depicts the flow of HRH Program funding from the Government of Rwanda through the various entities charged with carrying out the work of the project.

Figure 4. Flow of HRH Program Funding



Funding will be disbursed to US-based partners based on standard sub-recipient agreements that 'flow down' all USG compliance terms. Disbursal of funds to institutions that technically fall within the Government of Rwanda (for example, the various schools and teaching hospitals) will be based on Memorandums of Understanding (MoU). Standard sub-recipient monitoring practices will be applied to

these institutions to ensure compliance with USG rules and regulations and the terms of their MoU agreement.

VIII. Budget Summary

A. Summary Budget, Year One: October 1, 2011 to Year Eight: September 30, 2019

The total budget of the HRH Program is $151.8 million over eight years. Costs are highest in Years One, Two, and Three of the project, diminishing significantly thereafter to reach $8 million by Year Eight, as US faculty phase out and hospital and school upgrades are completed. In Years One, Two, and Three elevated costs are due to the large investments in infrastructure, equipment, and supplies needed at Rwandan institutions to facilitate the major improvements in educational quality that the HRH Program seeks to achieve. These investments will provide a strong foundation for the teaching, mentorship, and learning that will take place over the subsequent five years of the project. In Years Two and Three, the influx of US faculty mentors contributes significantly to elevated costs of the program. These costs taper down starting in Year Four, as US faculty transfer capacity to Rwandan educators and leave the program.

Additional detail on costs outlined below is available by individual institution in Appendix 1.

1. **Program Management** is the cost for the Ministry of Health to manage the HRH Program, a total of $7.6m over eight years. Personnel costs include 17 FTEs at the SPIU and 6 at the Medical Education and Research Unit. For the first four years Personnel costs include 5 FTEs for the SPIU; the remaining 12 FTEs are funded through an existing World Bank grant (which provides general support for HRH initiatives) until Year Five. When the HRH Program absorbs the cost of these 12 FTEs in Year Five, annual costs will be $829,863. Other Direct Costs include monitoring and evaluation activities, trainings, licensing and malpractice fees.

2. **Rwandan Schools** total $29.8m over eight years, and includes costs for infrastructure and equipment upgrades related to improving the quality of health education, as well as student support that will be provided to encourage recruitment and retention. Costs for Rwandan Schools are highest in Year One at $6.9m, due to the intense investment in infrastructure and equipment, and then taper down to $2.1m by Year Eight.

3. **Teaching Hospitals** will require $29.4m from the HRH Program, which is primarily driven by Construction, Equipment, and Supplies to improve clinical training and quality of patient care. Other Direct Costs includes maintenance for Construction and Equipment investments, calculated at 7.5% of all prior Construction costs and 10% of all prior equipment purchases (except in the first year). Personnel costs are dedicated to equipment maintenance staff. Overall costs for Teaching Hospitals are highest in Years One to Four, and decrease thereafter.

4. **US Academic Partners** total $84.9m over eight years. This cost category includes all expenses related to the involvement of 609 FTEs from the US Academic Consortium participating in the HRH Program. In Year One, the commitment by the US Academic Consortium is primarily related to Planning and Systems Strengthening Activities. Costs then rise in Years Two and Three, reflecting the influx of US faculty and mentors. Costs then phase down in Year Four, as capacity is transferred to Rwandan partners and US faculty begin to phase out.

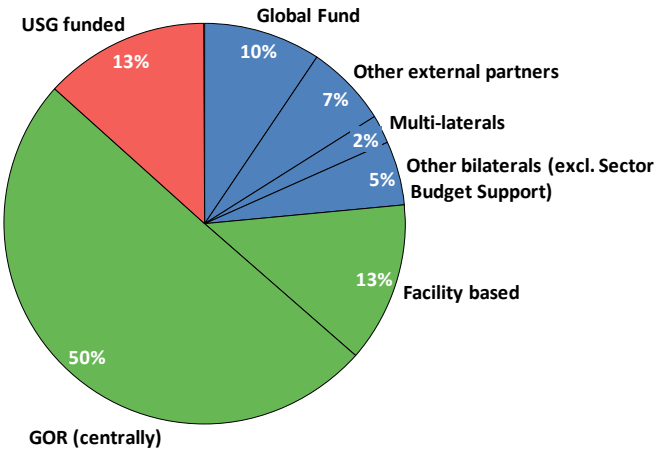
Table 15. Overall HRH Program Budget Summary, Year One - Year Eight

Items	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Total
Program Management	**714,393**	**695,135**	**1,353,735**	**567,708**	**1,118,141**	**1,076,541**	**1,039,091**	**1,047,664**	**7,612,408**
Personnel	280,535	304,668	304,668	304,668	808,276	808,276	808,276	800,231	4,419,598
Equipment	161,172	0	0	0	0	0	0	0	161,172
Supplies	20,267	11,700	11,700	11,700	11,700	11,700	11,700	11,700	102,167
Other Direct Costs	252,419	378,767	1,037,367	251,340	298,165	256,565	219,115	235,732	2,929,471
Rwandan Schools	**6,906,500**	**3,371,580**	**3,912,574**	**3,632,192**	**3,599,313**	**3,265,939**	**3,056,302**	**2,086,217**	**29,830,617**
Personnel	95,556	257,215	271,090	271,090	271,090	271,090	271,090	214,286	1,922,506
Travel	155,240	150,000	150,000	150,000	150,000	150,000	150,000	0	1,055,240
Equipment	842,116	0	0	0	105,000	0	0	0	947,116
Supplies	899,143	856,371	852,970	685,363	705,003	715,740	715,740	516,403	5,946,733
Construction	4,507,067	333,333	333,333	0	0	0	0	0	5,173,733
Other Direct Costs	407,380	1,774,661	2,305,180	2,525,739	2,368,220	2,129,109	1,919,472	1,355,529	14,785,290
Teaching Hospitals	**11,455,594**	**5,140,594**	**3,665,969**	**2,874,157**	**1,646,189**	**1,570,194**	**1,570,194**	**1,505,694**	**29,428,585**
Personnel	25,000	102,500	112,500	120,000	120,000	120,000	120,000	90,000	810,000
Equipment	5,379,786	1,788,162	1,338,162	904,000	63,000	0	0	0	9,473,110
Supplies	1,252,081	822,071	464,236	259,683	93,870	90,000	90,000	67,500	3,139,441
Construction	4,788,727	1,645,489	685,676	354,844	16,675	0	0	0	7,491,411
Other Direct Costs	10,000	782,372	1,065,395	1,235,630	1,352,644	1,360,194	1,360,194	1,348,194	8,514,623
US Academic Partners	**5,896,481**	**15,715,934**	**16,046,093**	**14,913,663**	**12,054,355**	**9,873,061**	**6,986,324**	**3,425,416**	**84,911,327**
Personnel	4,493,839	12,351,105	12,600,735	11,769,375	9,512,410	7,820,400	5,563,790	2,822,145	66,933,799
Travel	572,586	565,000	497,500	405,000	350,000	270,000	182,500	0	2,842,586
Other Direct Costs	537,002	2,018,909	2,156,876	2,000,368	1,594,425	1,291,191	890,139	425,506	10,914,415
Indirect	293,055	780,920	790,983	738,920	597,520	491,470	349,895	177,765	4,220,528
Grand Total	**24,972,968**	**24,923,243**	**24,978,370**	**21,987,720**	**18,417,998**	**15,785,735**	**12,651,911**	**8,064,991**	**151,782,937**

IX. Long-term Sustainability

The Government of Rwanda is well positioned to sustain the HRH Program over the long-term. Two-thirds of the budget for all HRH initiatives already comes from the Government of Rwanda, whether directly through the central budget or from the government-funded schools and hospitals themselves. Figure 5 below depicts the proportion of funding for HRH initiatives in FY11 derived from the Government of Rwanda as opposed to from external sources. (Please note that funds for HRH do not necessarily run through the Government of Rwanda; rather, all NGOs or other entities working on health-related initiatives in Rwanda report the associated budget to the government, which tracks them accordingly. USG funding is comprised primarily of CDC and USAID in-country operations related to health.)

Figure 5. Proportion of Funding for Current HRH Initiatives in Rwanda



In regards to the HRH Program, the initial cost of infrastructure, equipment, and US faculty accounts for the largest proportion of the eight-year budget. These items are clustered in the project's first few years; by its final year, the annual HRH Program budget is set at $8 million. At this point, all major infrastructure projects will be completed, and Rwandan faculty, lecturers, and mentors will have largely replaced US faculty members. The primary costs following the close of the eight-year project period will be the salaries of the increased numbers of Rwandan physicians, nurses, oral healthcare providers, and health managers that are the ultimate goal of the HRH Program. These are anticipated to total approximately $43 million per year. In addition there will be roughly $9 million in annual tuition fees and $1.5 million in equipment maintenance costs which the Government of Rwanda will need to cover. Refer to Appendix 2 for more detailed calculations.

The projected growth of the Government of Rwanda's budget will be more than sufficient to cover the cost of these salaries. In FY12, Rwanda's overall health sector budget was $167 million, which represented 10.20% of the Rwandan national budget overall. The Government of Rwanda is a signatory to the Abuja Declaration on HIV/AIDS, Tuberculosis, and Other Related Infectious Diseases (Abuja, Nigeria, April 2001), which commits countries to allocating 15% of the total national budget to health spending; President Kagame has stated that he aims to achieve this target within a short time period.

Based on this increased commitment to health sector spending, coupled with an anticipated 5% annual increase in the Rwandan budget overall (a realistic estimate considering projected GDP growth and recent budget trends), Rwanda's annual health sector budget will be approximately $339 million by

2018, an additional $172 million over and above the current budget – rendering the $54.5 million in salary, tuition fee and equipment maintenance costs well affordable. Thus, no external funding will be required to support the increases in the Rwandan health workforce brought about by the HRH Program once the project closes in 2019.

X. Timeline

The HRH Program is an eight-year endeavor, with an anticipated project period of October 2011 – July 2019. The HRH Program timeline is designed in part to facilitate the realization of the health-related goals outlined in *Vision 2020*, Rwanda's national long-term strategic plan for health and economic development.

Substantial planning for the HRH Program has been underway since early 2010. In May 2011, the Government of Rwanda organized a week-long collaborative working session between Rwandan representatives from the Ministry of Health, teaching institutions, and hospitals and delegations from the US Academic Consortium. The purpose of the week was to solicit broad-based input on the HRH Program, as well as to work in sub-groups to develop detailed concept papers for each health cadre. The output of that week's intensive collaborations is the basis for the health cadre-specific plans summarized in the 'Technical Approach and Strategy' section and detailed in Appendix X. These sub-groups, each composed of Rwandan and US experts, continue to be engaged in the further development of their respective focus areas so they are poised to make these plans operational as swiftly as possible should funds be awarded.

The HRH Program will begin with an intensive Planning Phase from October 2011 – September 2012, further detailed in Appendix 3. During the Planning Phase:

- The HRH Steering Committee will convene to establish program oversight mechanisms and procedures.
- Health Cadre Sub-Groups will be convened to devise a recruitment strategy for US mentors, review and revise curricula as needed, plan for deployment of US mentors, and engage in collaborative program development.
- The SPIU will sign all MOUs and sub-recipient agreements, conduct trainings for all MOU partners on financial, procurement, and administrative policies and procedures, and begin the contracting and procurement process for infrastructure and equipment upgrades.
- The Ministry of Health will complete hiring for and establish the HRH Program Support Unit, which will then begin the recruitment process for any vacant positions. The HRH Administrative Support Section will develop orientation materials, a deployment plan, and a medical licensure process for US faculty, and begin development of M&E tools and procedures.
- US Academic Institutions will recruit, interview, and obtain credentials for the first cohort of US faculty that will participate in the project.

The HRH Program Implementation Phase will begin in July 2012 and continue through the close of the project in July 2019, encompassing seven full academic years. Major benchmarks include the following:

- All facility upgrades will be completed by the end of 2013 to enable the upgraded facilities to be used for the majority of the project. Thus, construction/renovation activities and equipment procurement will be initiated as soon as possible following the award of funds.

- The first cohort of US faculty will sign their contracts with Rwandan institutions in April 2012 and will arrive in Rwanda for orientation in July 2012. This timeline will be repeated annually for each successive cohort of US faculty, with slight variations for individual faculty according to the academic schedule of the Rwandan program in which they are participating.
- Beginning in August 2012, a cohort of 10 outstanding Rwandan postgraduates and junior faculty members will be selected each year for three years to attend further training in subspecialties abroad, for a total of 35 people.
- US faculty involvement will be progressively phased to zero by the end of the 2018 academic year (July 2019), when the last cohort of HRH Program health professionals will graduate and implementation will end.

As noted above, M&E activities will be ongoing throughout the project. To monitor financial management and the quality of data collection the SPIU will conduct quarterly site visits to all MOU partners. Annual internal audits will also be performed by the SPIU.

Table 16. Timeline for HRH Program

	2011			2012									2013	2014	2015	2016	2017	2018
Task	*Oct*	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	Jul	Aug	Sep						
Planning and Systems Strengthening																		
Program Management																		
Establish HRH Steering Group																		
Hire Program Support Unit Staff																		
Design orientation for US faculty in Rwanda																		
Establish Health Cadre Sub-Groups																		
Develop US faculty deployment strategy (Health Cadre Sub-Groups)																		
Facilitate process of medical licensure for U.S. Faculty																		
Develop detailed needs assessment for infrastructure and equipment																		
Hire Administrative Support Officers for each program area																		
Recruitment of students																		
Financial Management (SPIU)																		
Hire new program staff																		
Cost and tender equipment and infrastructure																		
Procure equipment																		
Secure housing for US faculty																		
Conduct orientation meeting for project sub-recipients																		
Conduct training of sub-recipients on financial, M&E , and procurement																		
Ensure that all MoUs and sub-recipient agreements are signed																		
Coordination of Academic Consortium																		
Develop recruitment materials																		
Interview candidates																		
Final decisions made re: FTEs																		
Sign MoUs between US Universities and GoR																		
Implementation Component																		
Program Management																		
U.S. faculty orientation in Rwanda																		
Deploy U.S. faculty to hospitals and pair with Rwandan faculty																		
by U.S. faculty to FOM, SPH, FNS, and SOD and pair with Rwandan faculty																		
Send postgraduates/junior faculty abroad for sub-specialty training																		
Financial Management																		
Upgrade Referral Hospitals																		
Upgrade Provincial and District Hospitals for FAMCO and Nursing																		
Upgrade Provincial Hospitals for Other Specialties																		
Upgrade Faculty of Medicine																		
Upgrade A1 Schools of Nursingand Midwifery																		
Upgrade Faculty of Nursing Sciences																		
Upgrade School of Dentistry																		

Budget

Appendix 1

Appendix 1. Budget

I. Summary Budget, Year One: October 1, 2011 to Year Eight: September 30, 2019

The total budget of the HRH Program is $151.8 million over eight years. Costs are highest in Years One, Two, and Three of the project, diminishing significantly thereafter to reach $8 million by Year Eight, as US faculty phase out and hospital and school upgrades are completed. In Years One, Two, and Three elevated costs are due to the large investments in infrastructure, equipment, and supplies needed at Rwandan institutions to facilitate the major improvements in educational quality that the HRH Program seeks to achieve. These investments will provide a strong foundation for the teaching, mentorship, and learning that will take place over the subsequent five years of the project. In Years Two and Three, the influx of US faculty mentors contributes significantly to elevated costs of the program. These costs taper down starting in Year Four, as US faculty transfer capacity to Rwandan educators and leave the program.

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D. **US Academic Partners** total $84.9m over eight years. This cost category includes all expenses related to the involvement of 609 FTEs from the US Academic Consortium participating in the HRH Program. In Year One, the commitment by the US Academic Consortium is primarily related to Planning and Systems Strengthening Activities. Costs then rise in Years Two and Three, reflecting the influx of US faculty and mentors. Costs then phase down in Year Four, as capacity is transferred to Rwandan partners and US faculty begin to phase out.

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Personnel	4,493,839	12,351,105	12,600,735	11,769,375	9,512,410	7,820,400	5,563,790	2,822,145	66,933,799
Travel	572,586	565,000	497,500	405,000	350,000	270,000	182,500	0	2,842,586
Other Direct Costs	537,002	2,018,909	2,156,876	2,000,368	1,594,425	1,291,191	890,139	425,506	10,914,415
Indirect	293,055	780,920	790,983	738,920	597,520	491,470	349,895	177,765	4,220,528
Grand Total	**24,972,968**	**24,923,243**	**24,978,370**	**21,987,720**	**18,417,998**	**15,785,735**	**12,651,911**	**8,064,991**	**151,782,937**

II. Detail by Institution, Year One to Year Eight

Institutions are divided into four categories: 1) Program Management, 2) Rwandan Schools, 3) Teaching Hospitals, and 4) US Academic Partners.

A. Program Management includes two units both within the Ministry of Health. The Medical Education and Research is responsible for program management and coordination. The SPIU is responsible for managing program funds, and also contributes to monitoring and evaluation.

B. Rwandan Schools includes five A1 Nursing Schools, and four schools under the umbrella of the Rwanda University of Medical and Health Sciences (RUMHS). In addition, a small budget for two logistics officers, as well as operating costs, is supplied as central resources to RUMHS. These staff are part of the HRH Support Unit.

C. Teaching Hospitals includes 14 hospitals that are included in the HRH Program, including 4 Referral Hospitals, 5 Provincial Hospitals, and 5 District Hospitals.

D. US Academic Partners includes all funds associated with the participation of 609 FTEs from the US Academic Consortium during the course of the program. The budget for Academic Partners was determined by the number of FTEs that will be recruited into each health cadre education program, rather than by specific institution.

Table 18. Overall HRH Program Budget Summary, Year One to Year Eight

Budget Category	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Total
Program Management	714,393	695,135	1,353,735	567,708	1,118,141	1,076,541	1,039,091	1,047,664	7,612,408
Medical Education & Research Unit	184,584	208,617	193,617	193,617	193,617	193,617	193,617	185,573	1,546,859
SPIU	529,809	486,518	1,160,118	374,091	924,524	882,924	845,474	862,091	6,065,549
Rwandan Schools	6,906,500	3,371,580	3,912,574	3,632,192	3,599,313	3,265,939	3,056,302	2,086,217	29,830,617
A1 Nursing Schools (5)	**4,309,159**	**1,242,957**	**1,504,359**	**1,435,216**	**1,462,229**	**1,462,229**	**1,462,229**	**1,066,656**	**13,945,032**
RUMHS	**2,597,341**	**2,128,624**	**2,408,215**	**2,196,976**	**2,137,085**	**1,803,710**	**1,594,073**	**1,019,561**	**15,885,585**
Faculty of Medicine	680,605	1,148,400	1,408,860	1,193,829	1,060,595	812,942	603,305	312,028	7,220,564
Faculty of Nursing Sciences	956,102	304,498	323,086	298,505	347,483	249,368	249,368	149,526	2,877,937
School of Dentistry	734,776	600,078	597,049	625,423	649,787	662,180	662,180	496,635	5,028,110
School of Public Health	180,933	30,773	34,345	34,345	34,345	34,345	34,345	16,496	399,927
RUMHS (central resources)	44,925	44,875	44,875	44,875	44,875	44,875	44,875	44,875	359,047
Teaching Hospitals	11,455,594	5,140,594	3,665,969	2,874,157	1,646,189	1,570,194	1,570,194	1,505,694	29,428,585
Referral Hospitals	**5,710,499**	**1,650,811**	**1,523,363**	**735,324**	**735,324**	**735,324**	**735,324**	**700,824**	**12,526,790**
CHUB (RH)	2,387,292	665,339	480,445	279,544	279,544	279,544	279,544	270,044	4,921,294
CHUK (RH)	2,699,545	767,338	721,180	324,078	324,078	324,078	324,078	314,578	5,798,950
Kanombe (RH)	402,802	130,682	265,670	87,000	87,000	87,000	87,000	77,500	1,224,657
KFH (RH)	220,860	87,452	56,068	44,702	44,702	44,702	44,702	38,702	581,890
Provincial Hospitals	**4,227,859**	**3,100,905**	**1,900,246**	**2,138,834**	**910,865**	**834,871**	**834,871**	**804,871**	**14,753,321**
Gihundwe (PH)	0	0	666,051	504,315	188,621	112,627	112,627	106,627	1,690,867
Kabgayi (PH)	1,279,299	302,947	344,919	142,383	142,383	142,383	142,383	136,383	2,633,079
Kibagabaga (PH)	0	1,684,152	220,525	1,139,535	227,260	227,260	227,260	221,260	3,947,251
Ruhengeri (PH)	1,594,624	326,700	215,199	162,236	162,236	162,236	162,236	156,236	2,941,706
Rwamagana (PH)	1,353,936	787,106	453,552	190,365	190,365	190,365	190,365	184,365	3,540,418
District Hospitals	**1,517,236**	**388,878**	**242,360**	**0**	**0**	**0**	**0**	**0**	**2,148,474**
Butaro (DH)	35,000	35,000	35,000	0	0	0	0	0	105,000
Byumba (DH)	588,404	48,190	20,236	0	0	0	0	0	656,830
Kibungo (DH)	410,140	82,786	131,888	0	0	0	0	0	624,814
Nyagatare (DH)	448,692	187,902	20,236	0	0	0	0	0	656,830
Rwinkwavu (DH)	35,000	35,000	35,000	0	0	0	0	0	105,000
US Academic Partners	5,896,481	15,715,934	16,046,093	14,913,663	12,054,355	9,873,061	6,986,324	3,425,416	84,911,327
Grand Total	**24,972,968**	**24,923,243**	**24,978,370**	**21,987,720**	**18,417,998**	**15,785,735**	**12,651,911**	**8,064,991**	**151,782,937**

A. Program Management

Program management will be carried out by the prime recipient, the Single Project Implementation Unit (SPIU), and the Medical Education & Research (ME&R) Unit of the Ministry of Health. While the SPIU will handle manly the financial and administrative aspects of the project, the ME&R Unit will provide programmatic support. Costs for program management are mostly driven by personnel and other direct costs, with some supply costs.

The vast majority of the personnel required to implement this project are employed directly by the Ministry of Health and will not receive any salary from the project's funds. Hundreds of Rwandan faculty, hospital managers, clinical mentors, and administrative personnel will be actively involved in the project, but will continue to receive their salary from the MOH payroll. This strategy aims to harness existing human resources within the Ministry of Health, and to increase their capacity through the HRH Program.

In some cases, however, additional Rwandan personnel are needed. These personnel are either under the Medical Education & Research Unit, focusing on program management and coordination, or within the SPIU, focusing on financial management and monitoring and evaluation.

The SPIU manages all funds for the HRH Program. In addition, the SPIU is responsible for handling the logistical requirements of US faculty on the ground. For example, the SPIU will cover medical licenses and medical malpractice insurance for US faculty. In-country orientation will also be provided. Other costs in this category are necessary for the SPIU and the ME&R Unit to implement the program, such as meetings for program implementers and site visits, and operational costs, such as communications and vehicle maintenance.

1. Single Project Implementation Unit (SPIU)

Table 19. SPIU Budget, Year One - Year Two

	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**143,951**		**143,951**
Coordination Staff Salary & Benefits			**143,951**		**143,951**
Contract Manager	36,085	1	36,085	1	36,085
Drivers	7,427	1	7,427	1	7,427
HRH Accountant	32,177	1	32,177	1	32,177
HRH Program Manager	36,085	1	36,085	1	36,085
Project Officer	32,177	1	32,177	1	32,177
Equipment			**161,172**		**0**
Operations			**161,172**		**0**
Office furniture for project staff	6,000	1	6,000	0	0
Project vehicles	51,724	3	155,172	0	0
Supplies			**14,467**		**6,000**
Operations			**14,467**		**6,000**
Office Supplies	1,500	4	6,000	4	6,000
Desk top computer and printer for project staff	1,922	3	5,767	0	0
Laptop computers for project staff (SPIU)	700	3	2,100	0	0
Retroprojector	600	1	600	0	0
Other Direct Costs			**210,219**		**336,567**
M&E			**16,000**		**12,600**
Mid-term review with project implementers, incluc	3,000	0	0	1	3,000
On-site data verification	1,600	4	6,400	0	0
Quarterly Supervision	800	12	9,600	12	9,600
Operations			**66,919**		**66,117**
Internet communication	80	36	2,880	36	2,880
Maintenance and repair for vehicle	500	30	15,000	32	15,750
Miscellaneous fees	2,000	12	24,000	12	24,000
Monthly fuel (3 vehicles)	1,440	12	17,280	12	17,280
Omnium insurance for project vehicle	2,586	3	7,759	2	6,207
Planning and System Strengthening Activities			**127,300**		**176,850**
External audit for MOU Partners and SPIU	50,000	1	50,000	1	50,000
In-Country Orientation for US faculty (1 week)	10,000	1	10,000	1	10,000
In-service training for project staff	10,000	0	0	3	30,000
Internal audit for MOU Partners	800	12	9,600	12	9,600
Internal tender committee fees	100	60	6,000	60	6,000
US Faculty Medical/Nursing Licenses	300	110	33,000	120	36,000
Orientation meeting with project MOU Partners	3,000	1	3,000	0	0
US Faculty Malpractice Insurance	500	14	7,000	59	29,250
Training for MOU Partner staff	1,000	1	1,000	0	0
Feedback meetings with project implementers	3,000	2	6,000	2	6,000
Boston planning meeting (organizing costs)	350	2	700	0	0
Rwanda planning meeting (organizing costs)	200	5	1,000	0	0
Technical Assistance			**0**		**81,000**
International consultant to conduct the mid-term e	600	0	0	60	36,000
National consultant for the evaluation of the impac	300	0	0	90	27,000
National consultant to conduct the mid-term evalua	300	0	0	60	18,000
Grand Total			**529,809**		**486,518**

a. Personnel

Costs within the SPIU for Years One and Two include 5 FTEs. All salaries are determined according to the standard SPIU salary scale. Although 17 FTEs are required to manage the HRH Program funds, the remaining 12 FTEs are funded through an existing World

Bank grant (which provides general support for HRH initiatives overall) until Year Five. When the HRH Program absorbs the cost of these additional 12 FTEs in Year Five, the SPIU budget will increase to accommodate these personnel.

b. Equipment

The SPIU will require three vehicles to facilitate transport between sites to meet with hospital accountants and administrators. Transportation is a significant limitation in Rwanda where public transport is slow and inefficient. Fuel is equally relatively expensive in Rwanda and therefore a line has been included in the "Other Direct Costs" category to ensure these vehicles can run, along with insurance.

c. Supplies

Standard office equipment for the additional staff being hired.

d. Other Direct Costs

The largest cost is for the annual external audit of the SPIU's and MOU partners' activities. The monitoring and evaluation capacity and internal audit capacity of the SPIU and MOU partners is also accounted for here. In Year Two the costs of external consultants to conduct a review of the program have been included.

In-country orientation for arriving US faculty is included in the SPIU management budget, as well as the malpractice insurance that all physicians will take on before they begin teaching.

In Year Three of the Program, $700,000 has been allocated in the SPIU budget for a service provision assessment, rendering the budget in Year Three higher than in previous years.

2. Medical Education & Research Unit

Table 20. Medical Education & Research Unit Budget, Year One – Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**136,584**		**160,717**
Coordination Staff Salary & Benefits			**128,540**		**128,540**
M&E Specialist	25,333	1	25,333	1	25,333
Administrative Assistant	21,587	1	21,587	1	21,587
Coordinator: Medical Education & Research	30,952	1	30,952	1	30,952
Program Manager	25,333	2	50,667	2	50,667
Program Staff Salary and Benefits			**8,044**		**32,177**
Research Specialist	32,177	0	8,044	1	32,177
Supplies			**5,800**		**5,700**
Operations			**5,800**		**5,700**
Printers	50	2	100	0	0
Laptops	700	6	4,200	6	4,200
Office Supplies	1,500	1	1,500	1	1,500
Other Direct Costs			**42,200**		**42,200**
Operations			**7,200**		**7,200**
Internet and communication fees	1,200	6	7,200	6	7,200
Planning and System Strengthening Activities			**20,000**		**20,000**
Field visits to MOU Partners	20,000	1	20,000	1	20,000
Other Program Initiatives			**15,000**		**15,000**
Networking Events for female physicians	2,500	2	5,000	2	5,000
Radio/TV ads for female physician program	5,000	1	5,000	1	5,000
Recruitment Sessions for female physician program	500	10	5,000	10	5,000
Grand Total			**184,584**		**208,617**

a. Personnel

The Medical Education and Research Unit will require five staff to coordinate the HRH Program. All salaries are determined according to the standard MoH salary scale. The Coordinator will be the focal point for all medical education and research and will be supported by the Administrative Assistant. Other members of staff will have specific functions to help manage the department.

b. Supplies

Basic equipment and office supplies will be needed to run the department.

c. Other Direct Costs

$20,000 per year will be allocated for the Medical Education & Research Unit to conduct field visits at the other MOU Partners under the program. $15,000 has been allocated in Years One and Two to support increased uptake of medicine as a career by Rwandan women.

B. Rwandan Schools

The Rwandan Schools are the main implementing partners in the HRH Program. They include:

Rwandan University of Medical and Health Sciences (RUMHS)

- Faculty of Medicine
- Faculty of Nursing Sciences
- School of Dentistry
- School of Public Health

A1 Nursing Schools

- Byumba School of Nursing and Midwifery
- Kabgayi School of Nursing and Midwifery
- Kibungo School of Nursing and Midwifery
- Nyagatare School of Nursing and Midwifery
- Rwamagana School of Nursing and Midwifery

Most of the costs budgeted for the HRH Program include upgrading the educational facilities with better infrastructure, equipment, and supplies. Personnel and other direct costs (mostly in the form of student support) as well as travel, are other key cost drivers for the Rwandan Schools.

Construction and equipment costs for educational facilities were determined through direct communication with the Deans and Directors of the individual schools. New infrastructure was considered where enrollment was increasing, as in the School of Health Management. Renovations and improvements were considered where enrollment was stable, but quality improvements were needed, as at the Faculty of Medicine. Dormitory space was calculated based on the estimated number of students at any given time staying at the facility, at a standard size of 10 m^2per person. All construction was priced using the SPIU standard price of $667 USD per m^2. Equipment costs included educational materials needed to provide high quality training, such as anatomical models. Supplies include basic educational needs, such as computers, for classroom-based training.

As mentioned previously, the vast majority of human resources needed to implement the HRH Program will come from existing faculty and staff currently employed by the MOH. However, to realize the massive HRH scale-up quickly, some additional personnel will be needed that are beyond the current scope of the Ministry of Health budget. These individuals will be hired through the HRH Program because they are critical to program's success and to the long-term success of health sciences education Rwanda. For example, the Administrative Assistants to the Heads of Department at the Faculty of Medicine, included in this budget, who will relieve the administrative burden of clinical mentors, allowing them more time to teach.

A key problem in retention of Rwandan health education students is the cost they incur during their studies. This is particularly difficult for medical and nursing students, who must travel on clinical rotations at different sites as part of their programs. Student support for these rotations, and for a small daily living allowance, is essential to improving retention and ultimately increasing the number of health professionals, and is therefore included in this budget. In addition, some training is not available in Rwanda, but specialists in these areas are desperately needed. Some students will be funded to attend educational programs abroad, including their tuition, travel, and stipend costs.

Research and academic exchange are a main work stream in the HRH Program. To incentivize students and faculty to engage in these activities, and allow them to share their work and learn from others, exceptional students and researchers will be sent to international academic conferences and workshops, for which travel is included in this budget.

1. Faculty of Medicine

Table 21. Faculty of Medicine Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**24,444**		**102,294**
Operations			**24,444**		**102,294**
Administrative Assistant Salary & Benefits (Anesthesiology)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Emergency Medicine	13,968	0	0	0.08	1,164
Administrative Assistant Salary & Benefits (ENT)	13,968	0	0	0.08	1,164
Administrative Assistant Salary & Benefits (FAMCO)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Internal Medicine)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Neurology)	13,968	0	0	0.08	1,164
Administrative Assistant Salary & Benefits (Ob/Gyn)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Orthopedics)	13,968	0	0	0.08	1,164
Administrative Assistant Salary & Benefits (Pathology)	13,968	0.08	1,164	0.33	4,610
Administrative Assistant Salary & Benefits (Pediatrics)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Psychiatry)	13,968	0.08	1,164	0.33	4,610
Administrative Assistant Salary & Benefits (Radiology)	13,968	0.08	1,164	0.33	4,610
Administrative Assistant Salary & Benefits (Surgery)	13,968	0.25	3,492	1	13,968
Travel			**75,000**		**75,000**
Student Development			**25,000**		**25,000**
Exchange Travel for Rwandan Students	5,000	5	25,000	5	25,000
Teaching Faculty Development			**50,000**		**50,000**
Exchange Travel for Rwandan Faculty	5,000	10	50,000	10	50,000
Equipment			**105,000**		**0**
Clinical learning			**105,000**		**0**
Anatomical Models	35,000	3	105,000	0	0
Construction			**333,333**		**333,333**
General Infrastructure Upgrades	1,000,000	0.33	333,333	0	333,333
Other Direct Costs			**142,827**		**637,772**
Student Support			**80,327**		**325,272**
Daily Living Stipends	459	145	66,328	579	265,885
Rotation Stipends	215	71	13,999	285	59,387
Training Abroad			**62,500**		**312,500**
Travel/Tuition for Subspecialty Residency Abroad	25,000	3	62,500	13	312,500
Grand Total			**680,605**		**1,148,400**

**Because rotation schedules vary from year to year, students in different years of the program receive different amounts in total. Therefore, the unweighted unit costs listed here do not lead to precice total costs when multiplied with student quantities.

a. Personnel

Each residency program will have an administrative assistant dedicated to support it. Some programs are large enough to require a full-time person to handle all the administrative duties, while some smaller programs will share the same assistant.

The larger residency programs include: FAMCO, pediatrics, surgery, obstetrics/gynecology, internal medicine and anesthesiology. Each program will require support services for planning the programs, scheduling and coordinating rotations, processing paperwork and orienting the faculty. The role will be to support the program director and they will play a key role to ensure a proper deployment of residents and faculty to ensure rotations can happens in the best possible circumstances.

b. Travel

During the course of interviews with different stakeholders, it emerged that one of the key impediments to retention and satisfaction in the health sector is the lack of

professional development opportunities. Interviewees underlined the importance of having two-way exchanges to enable Rwandans to go abroad in addition to having foreign faculty come to Rwanda. These exchanges would benefit Rwandans by immersion in a different environment and exposure to different ways of practicing medicine. In addition, they would have the opportunity to learn skills they could not learn in Rwanda. In addition, these rotations would help foster international collaborations, partnerships and research opportunities in order to advance the academic visibility of Rwanda internationally, which would also greatly benefit institutional capacity.

c. Equipment

Anatomical models are essentials to demonstrate procedures and enable students to practice critical procedures on models multiple times before trying them on a real patient. These models are technologically advanced and in actual size to ensure a realistic simulation of real life situation. They allow student to practice every procedure as many times as they need.

d. Construction

The current state of infrastructure at the Faculty of Medicine is in urgent need of maintenance or upgrades. The school operates with insufficient number of classrooms and labs, while the existing ones require significant refurbishing. While the investments in infrastructure are not extensive (i.e. no new buildings are planned) they will ensure a sufficient working capacity for the school over the next few years.

e. Other direct costs

Student support was identified as an important factor to ensure undergraduate students can afford to go on their rotations. This will ensure that a high number of students graduate each year in order to provide a sufficient supply of candidates for the residency programs,

Training abroad is an important part of the plan, as some training programs will not be offered in-country and will need to be accommodated in other countries. This is especially true for some smaller specialties of sub-specialties (e.g. cardiology, nephrology, gastroenterology, etc.) where the numbers of people to be trained do not justify the creation of a program in-country. Rwanda already has existing agreements with other countries for sending residents, which should facilitate the process.

2. Faculty of Nursing Sciences

Table 22. Faculty of Nursing Sciences Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**3,492**		**13,968**
Administrative Assistant Salary & Benefits	13,968	0.25	3,492	1	13,968
Travel			**52,620**		**50,000**
Planning and System Strengthening Activities			**2,620**		**0**
Rwandan faculty travel to Boston meeting (nursing & midwif	2,620	1	2,620	0	0
Student Development	5,000	5	25,000	5	25,000
Exchange Travel for Rwandan Students	5,000	5	25,000	5	25,000
Teaching Faculty Development	5,000	5	25,000	5	25,000
Exchange Travel for Rwandan Faculty	5,000	5	25,000	5	25,000
Equipment			**260,364**		**0**
Clinical learning			**260,364**		**0**
Anesthesia Machine	15,000	1	15,000	0	0
Mobile X-ray Machine	6,500	1	6,500	0	0
Full body pregnancy simulator	20,864	1	20,864	0	0
Anatomical Models	35,000	3	105,000	0	0
One-way Mirror	10,000	1	10,000	0	0
Ventilator	10,000	2	20,000	0	0
Monitors	12,000	3	36,000	0	0
Ultrasound	44,000	1	44,000	0	0
Aspirator	1,500	2	3,000	0	0
Supplies			**102,974**		**22,000**
Clinical learning			**71,074**		**0**
IV Trainer	375	2	750	0	0
Auscultation trainer (child)	1,377	1	1,377	0	0
Bed sore wound care simulator	1,342	1	1,342	0	0
Central venous canulation simulator	693	1	693	0	0
Male skeleton	2,254	2	4,508	0	0
Muscles of the foot	958	1	958	0	0
Muscles of the leg	1,164	1	1,164	0	0
Muscles of the arm	1,047	1	1,047	0	0
Fetal doll	696	1	696	0	0
Bedside Lockers for Skillslab	522	15	7,830	0	0
Desks for Skillslab	100	20	2,000	0	0
Hospital Beds for Skillslab	420	10	4,200	0	0
Partitions for Skillslab work spaces	2,000	20	40,000	0	0
Storage Shelves for Skillslab	200	20	4,000	0	0
Fetal circulation system	509	1	509	0	0
Non-clinical learning			**26,700**		**22,000**
Faculty computers & text books	2,000	1	2,000	0	0
Nursing Journal Subscriptions	2,000	0	500	1	2,000
Procedure Manual Development	10,000	1	10,000	1	10,000
Procedure Manual Film	10,000	1	10,000	1	10,000
LCD projectors	600	7	4,200	0	0
Operations			**5,200**		**0**
Laptops	700	6	4,200	0	0
Office chairs, partitions	1,000	1	1,000	0	0
Construction			**483,230**		**0**
Skillslab Expansion	920,460	1	460,230	0	0
Sluice Room	23,000	1	23,000	0	0
Other Direct Costs			**53,422**		**218,530**
Student Support			**28,422**		**118,530**
Daily Living Stipends	459	57	26,049	237	108,557
Rotation Stipends**	47	53	2,373	221	9,973
Training Abroad			**25,000**		**100,000**
Travel/Tuition for Nursing Master's Program Abroad	20,000	1.25	25,000	5	100,000
Grand Total			**956,102**		**304,498**

**Because rotation schedules vary from year to year, students in different years of the program receive different amounts in total. Therefore, the unweighted unit costs listed here do not lead to precice total costs when multiplied with student quantities.

Budget support for the Faculty of Nursing Sciences is $956,102 in Year One, with most of that amount related to construction costs ($483,230) for expansion of the skills lab and the equipment needed to operate the lab ($260,364). This lab will serve all nursing and midwifery students and be shared with the oral health program. Funds will also be used to purchase laptops, office furniture, textbooks and other learning materials in Year One.

Travel Costs include $25,000 per academic year for 5 faculty members of FNS to travel outside the country for conferences or special educational programs. Other travel costs include $2,620 for one representative of FNS to attend a meeting of the US academic partners during the planning phase of the program. Travel costs also include $25,000 per academic year for 5 students per year to travel in order to participate in unique educational opportunities.

Other Direct Costs also include student support, which will continue throughout the program. This support is budgeted at $28,422 in Year One, but it will increase to $118,530 in year 2, and increase slightly each year as the number of students increases. Each student at FNS will receive a stipend for daily living expenses while on campus as well as when they are doing their clinical rotations at the teaching hospitals or health centers outside of Kigali. In addition, five students per year (years 1, 2 and 3) will be funded to study for a Master's degree outside of Rwanda, at a cost of $20,000 per student. In years 4-8, funds will be used to support master's students studying at the newly established MSN program at FNS.

3. A1 Schools of Nursing and Midwifery

Table 23. A1 Schools of Nursing and Midwifery, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**17,460**		**69,841**
Administrative Assistant Salary & Benefits (Byumba SNM)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Kabgayi SNM)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Kibungo SNM)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Nyagatare SNM)	13,968	0.25	3,492	1	13,968
Administrative Assistant Salary & Benefits (Rwamagana SNM)	13,968	0.25	3,492	1	13,968
Travel			**27,620**		**25,000**
Planning and System Strengthening Activities			**2,620**		**0**
Rwandan faculty travel to Boston meeting (nursing & midwifery)	2,620	1	2,620	0	0
Teaching Faculty Development			**25,000**		**25,000**
Exchange Travel for Rwandan Faculty	5,000	5	25,000	5	25,000
Equipment			**476,752**		**0**
Clinical learning			**175,000**		**0**
Anatomical Models	35,000	5	175,000	0	0
Non-clinical learning			**192,982**		**0**
Electronic Journals	16,667	5	83,333	0	0
Library Books	16,667	5	83,333	0	0
Cabling/Installation	5,263	5	26,315	0	0
Operations			**108,770**		**0**
Furniture	21,754	5	108,770	0	0
Supplies			**592,249**		**291,430**
Clinical learning			**15,353**		**61,410**
Medical Consumables	4,094	4	15,353	15	61,410
Non-clinical learning			**460,935**		**190,020**
Classroom Chairs	25	500	12,500	0	0
Classroom Desks	133	500	66,667	0	0
Classroom Projectors	600	10	6,000	0	0
Classroom Screens	167	10	1,667	0	0
Classroom Whiteboards	133	10	1,333	0	0
Library Chairs	25	800	20,000	0	0
Library Shelves	333	200	66,667	0	0
Library Tables (Big)	250	150	37,500	0	0
Library Tables (Small)	133	50	6,667	0	0
Projectors (e-learning program)	600	15	9,000	0	0
Server (e-learning program)	1,754	5	8,770	0	0
Video camera (e-learning program)	1,579	5	7,895	0	0
Antivirus Software	25	250	6,250	250	6,250
CD Roms	105	250	26,250	0	0
Charts	1,754	5	8,770	5	8,770
Computers (e-learning)	700	250	175,000	250	175,000
Operations			**28,045**		**40,000**
Printers	50	10	500	0	0
Copier	3,509	5	17,545	0	0
Office materials (e.g., paper, telephone)	4,000	3	10,000	10	40,000
Student Support			**87,917**		**0**
Dormitory beds	125	250	31,250	0	0
Dormitory Chairs	33	250	8,333	0	0
Dormitory Desks	83	250	20,833	0	0
Dormitory Mattresses	42	250	10,417	0	0
Refectory Chairs	33	250	8,333	0	0
Refectory Shelves	83	25	2,083	0	0
Refectory Tables	133	50	6,667	0	0
Construction	**97,222**		**3,000,000**		**0**
Classrooms	16,667	10	166,667	0	0
Computer Rooms	83,333	5	416,667	0	0
Library Extensions	83,333	5	416,667	0	0
Offices	25,000	5	125,000	0	0
Practical Rooms	41,667	5	208,333	0	0
Student dormitory (50 beds)	333,333	5	1,666,667	0	0
Other Direct Costs			**195,078**		**856,685**
Student Support			**195,078**		**856,685**
Daily Living Stipends	459	319	146,311	1,388	636,885
Rotation Stipends	162	319	48,767	1,388	219,800
Grand Total			**4,309,159**		**1,242,957**

**Because rotation schedules vary from year to year, students in different years of the program receive different amounts in total. Therefore, the unweighted unit costs listed here do not lead to precice total costs when multiplied with student quantities.

Much of the cost related to the five schools of nursing and midwifery is in Year One, when infrastructure and equipment upgrades will take place. Of the total Year One budget of $4,309,159, $3 million USD has been budgeted for the construction of classrooms, computer rooms, libraries, offices and dormitories at each school in Year One. This is a one-time expense. Also in year 1, furniture, skills lab models and office equipment will be purchased for each school. The cost of furniture and equipment will decrease in Year Two, when construction is completed and all equipment has been purchased.

Salaries for one administrative assistant at each school will total $17,460 in Year One and rise to $69,841 for the remainder of the program.

Students will be provided stipends for living expenses while at the school and during their clinical rotations at the teaching hospitals and health centers. Funds are also provided for 5 faculty members per year from the schools of nursing and midwifery to travel outside the country for conferences or special educational programs, at a cost of $25,000 per academic year. One representative of the 5 schools will also travel to the US for a meeting with the US academic partners during the planning phase of the program.

4. School of Dentistry

Table 24. School of Dentistry Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**3,492**		**13,968**
Administrative Assistant Salary & Benefits	13,968	0.25	3,492	1	13,968
Supplies			**177,028**		**530,841**
Clinical learning			**172,594**		**530,841**
Dental Chairs	3,000	13	39,000	0	0
Supplies for Clinical Practice: Year 1 Students	20	1,859	37,968	7,943	162,226
Supplies for Clinical Practice: Year 2 Students	44	1,140	50,453	4,522	200,131
Supplies for Clinical Practice: Year 3 Students	31	1,480	45,173	5,520	168,484
Non-clinical learning			**4,433**		**0**
Projectors (LCD)	600	6	3,600	0	0
Classroom Screens	167	5	833	0	0
Construction			**540,470**		**0**
Classrooms	40	3	120	0	0
Classrooms	40	3	120	0	0
Conference Hall	53,360	1	53,360	0	0
Conference Hall	53,360	1	53,360	0	0
Laboratories	26,680	1	26,680	0	0
Laboratories	26,680	1	26,680	0	0
Skillslab Expansion	920,460	0.5	460,230	0	0
Skillslab Expansion	920,460	0.5	460,230	0	0
Staff Offices	16	5	80	0	0
Staff Offices	16	5	80	0	0
Other Direct Costs			**13,787**		**55,269**
Student Support			**13,787**		**55,269**
Daily Living Stipends	459	28	12,738	111	51,066
Rotation Stipends*	40	28	1,049	111	4,204
Grand Total			**734,776**		**600,078**

**Because rotation schedules vary from year to year, students in different years of the program receive different amounts in total. Therefore, the unweighted unit costs listed here do not lead to precice total costs when multiplied with student quantities.

a. Personnel

The dentistry program will have an administrative assistant dedicated to support it, as the program is large enough to require a full time person to handle all the administrative duties. The program will require a lot of support services for planning the programs, scheduling and coordinating rotations, processing paperwork and orienting the faculty. The role will be to support the program director and he/she will play a key role to ensure a proper deployment of students and faculty to ensure rotations can happen in the best possible circumstances.

b. Supplies

The dentistry program is going to be significantly expanded in size and skill level. Most of the current supplies are limited and insufficient to meet training needs. This program will need to acquire dental chairs at the beginning of the program to ensure students can be trained, as well as the corresponding supplies for each program year. Additional pedagogical supplies, like projectors and screens will also be necessary for lectures and groups sessions, as they are currently insufficient.

c. Construction

The current state of infrastructure at the school of dentistry is barely adequate for the needs of the existing program. With the expansion envisioned under this new program,

the school will need to build the minimum infrastructure required to train the corresponding number of students. The capacity of classrooms, labs, conference halls and offices was calculated using the ratio of envisioned students and teachers.

d. Other Direct Costs

Student support was identified as an important factor to ensure students can afford to attend onsite clinical training.. This will ensure that a high number of students stay within the program for its duration.

5. School of Public Health

Table 25. School of Public Health Budget, Year One to Year Two

	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**3,492**		**13,968**
Administrative Assistant Salary & Benefits	13,968	0.25	3,492	1	13,968
Supplies			**26,342**		**11,600**
Non-clinical learning			**26,342**		**11,600**
Computers	700	10	7,000	0	0
Books	100	34	3,400	64	6,400
Copier	3,509	2	7,018	0	0
Journal Subscription	2,000	1	2,000	1	2,000
Printer	50	2	100	0	0
Projector	640	4	2,560	0	0
Projector (LCD)	600	4	2,400	0	0
Scanner	82	2	164	0	0
Software for students	50	34	1,700	64	3,200
Construction			**150,033**		**0**
Classrooms	26,680	2	53,360	0	0
Conference Rooms	13,340	1	13,340	0	0
Library Extension	83,333	1	83,333	0	0
Other Direct Costs			**1,066**		**5,205**
Student Support			**1,066**		**5,205**
Rotation Stipends	125	9	1,066	42	5,205
Grand Total			**180,933**		**30,773**

The School of Public Health will not require a substantial financial investment to run the health management courses.

a. Personnel

The School of Public Health already has most of the staff members in place that it requires to run and teach the health management courses. They are in need of one administrative assistant to support the management of the program.

b. Supplies

Computers, books, photocopiers, printers and projectors are required to deliver course materials to students. Journal subscriptions will keep faculty and students up to date in regard to latest international thought on health management.

c. Construction

The School of Public Health has an existing campus in Kigali, however to cater to the increased number of students in the new courses in health management which will be offered, some extra teaching and studying space is needed.

d. Student Support

Each student will receive a stipend while they are rotating through Kigali for

their classroom-based teaching, which is 25% of total course time.

C. Teaching Hospitals

To provide settings where students can learn to deliver high quality healthcare, teaching hospitals must have the equipment and infrastructure necessary to properly complete procedures and administer treatments to patients. They must also have infrastructure specific to teaching, such as classrooms, and to serve basic needs of students on rotation, such as dormitories. 12 hospitals will be upgraded to meet these educational and clinical requirements:

Referral Hospitals

- CHUB
- CHUK
- Kanombe Hospital
- KFH

Provincial Hospitals

- Gihundwe Hospital
- Kabgayi Hospital
- Kibagabaga Hospital
- Ruhengeri Hospital
- Rwamagana Hospital

District Hospitals

- Byumba Hospital
- Kibungo Hospital
- Nyagatare Hospital

The four referral hospitals play a critical role in the HRH Program. Because they are centralized around Kigali and Butare (near the current Faculty of Medicine location), most clinical rotations will be centered at these hospitals in the early years of the Program before the provincial hospitals have sufficient capacity to provide high-quality instruction to an increased number of rotating students. More specialized residencies (e.g., anesthesiology) will take place exclusively at the referral hospitals throughout the HRH Program. Therefore, these hospitals require a large and early investment in infrastructure, equipment, and supplies. All four will be included under the HRH Program beginning in Year 1.

The provincial hospitals included under the HRH Program will become increasingly important throughout the plan as clinical rotation sites for medical students, residents, dentistry students, and nursing students. Kabgayi, Rwamagana, and Ruhengeri will receive upgrades beginning in Year 1 and extending through Year 3, Kibagabaga will receive upgrades beginning in Year 2 and extending through Year 4. Gihundwe will receive upgrades beginning in Year 3 and extending through Year 5, and therefore is not presented in this appendix.

The district hospitals included under the HRH Program include Byumba, Kibungo, and Nyagatare and will receive upgrades necessary for clinical instruction in nursing only. Each of

these hospitals is connected with one of the five A1 Schools of Nursing & Midwifery (the other two, Kabgayi and Rwamagana, are included under the more extensive provincial hospital upgrades). The needs are similar across all three, and are based on a detailed assessment conducted at Byumba. The upgrades at these hospitals will therefore be less extensive than those at the referral or provincial hospitals. Each hospital will be upgraded beginning in Year 1. Upgrades will extend through Year 3. Two additional district hospitals, Butaro and Rwinkwavu, will serve as additional sites for the A1 Nursing & Midwifery e-learning program. These will receive funding for 50 computers each year in Year 1, Year 2, and Year 3.

Supplies, equipment, and construction costs for teaching hospitals were calculated based on a preliminary needs assessment, an inventory, verification with relevant leadership, and pricing using the ECRI database and SPIU standards. In discussion groups during the May 2011 Consortium meeting with US and Rwandan faculty, key supplies, equipment and infrastructure needed to train students in clinical settings were identified by specialty and program. The number of students and faculty per facility was also considered. This preliminary needs assessment formed the basis for inventory forms listing the equipment and infrastructure needed based on the type of facility (referral, provincial, or district hospital). These inventories were then completed by Ministry of Health personnel together with administrators in each facility, determining if or how many of a given item the hospital currently had, and how many it would require based on the number of students expected and the patient load. Inventories were further reviewed by Ministry of Health personnel.

Equipment was then priced using the ECRI database and, when items were not available, through medical supply companies and consultation with medical practitioners. All construction was priced using the SPIU standard price of $667 USD per m^2. Equipment was assigned to a budget year based on the schedule for upgrades by specialty or program. Final equipment lists and procurement schedules were then reviewed and verified by the Director Generals of the Hospitals. Only equipment and infrastructure deemed absolutely necessary for patient care in the areas of the clinical rotations was included in the final budgets. The individual hospital budgets vary substantially because each facility currently has different levels of infrastructure and equipment, and therefore require different levels of investment to bring them to a standard level of quality. In addition, not all specialty rotations will be carried out in all hospitals, reducing the equipment and infrastructure needed in some of the less occupied facilities.

Other direct costs include the cost of maintaining equipment and infrastructure and training technicians in maintenance. Equipment maintenance costs were calculated at a standard rate of 10% per year[56] of the total prior equipment investment, while construction costs were 7.5% of the total prior construction investment.

[5] World Bank (2009).
[6] WHO (2011)

1. Centre Hospitalier Universitaire de Kigali (CHUK)

Table 26. CHUK Budget Summary, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**5,000**		**20,000**
Maintenance Staff Salary & Benefits	10,000	0.5	5,000	2	20,000
Equipment			**1,804,500**		**426,000**
Anesthesia Machine	20,000	3	60,000	2	40,000
Blood gas machine	16,000	1	16,000	0	0
Cell Counter	35,000	2	70,000	0	0
Colonoscope	22,000	2	44,000	0	0
Colposcope	7,000	1	7,000	1	7,000
Cryosurgery equipment	30,000	6	180,000	0	0
Laparoscope	20,000	1	20,000	0	0
Laser equipment	12,000	4	48,000	0	0
Portable x-ray machine	10,000	1	10,000	0	0
Bronchoscope	16,000	2	32,000	0	0
Cardiac Echocardiography machine	11,000	1	11,000	0	0
Echocardiography machine (portable)	11,000	1	11,000	0	0
laser machine (opthamology)	12,000	1	12,000	0	0
Nephroscope	6,000	1	6,000	0	0
Dermatome	12,000	1	12,000	1	12,000
Fluoroscope	60,000	2	120,000	0	0
Gastrocope (peds)	20,000	1	20,000	1	20,000
Pediatric bronchoscope	16,000	2	32,000	0	0
Resectoscope	16,000	2	32,000	0	0
Resectoscope- pediatrics	16,000	2	32,000	0	0
Electrocautery	6,000	3	18,000	2	12,000
Incubators	16,000	5	80,000	3	48,000
Fetal monitors	5,000	3	15,000	1	5,000
Monitoring equipment (ECH, pulse, temperature, 5 PO2)	25,000	10	250,000	10	250,000
Surgical light	15,000	4	60,000	0	0
Ultrasound (portable)	44,000	6	264,000	0	0
Ultrasound (radiology)	44,000	4	176,000	0	0
Ultrasound with capability for Doppler and color	15,000	2	30,000	0	0
Ureteroscope	8,500	1	8,500	0	0
Ventilator	10,000	6	60,000	0	0
Video Colonoscope (including monitor)	32,000	1	32,000	1	32,000
Video Gastroscope	18,000	2	36,000	0	0
Supplies			**154,345**		**105,560**

EKG	4,000	1	4,000	1	4,000
Gynecological table	292	3	876	2	584
Oxygen delivery system	300	3	900	3	900
Cardiac stress testing treadmill	500	1	500	0	0
CPAP	1,000	2	2,000	1	1,000
Cystoscope	3,000	1	3,000	0	0
Dental Chairs	3,000	1	3,000	0	0
Hysteroscope	4,500	1	4,500	0	0
LEEP equipment	4,816	1	4,816	1	4,816
Manual tracheal suction	400	2	800	0	0
Resuscitation equipment (neonatal)	1,200	2	2,400	1	1,200
spectrophotometer	1,800	1	1,800	1	1,800
Spirometer	2,000	1	2,000	1	2,000
equipment for urogynecology procedures	2,000	1	2,000	0	0
Major surgery kit for ophthalmology	500	2	1,000	1	500
Portable EKG	3,500	1	3,500	0	0
IV and feeding pumps	2,000	4	8,000	0	0
Laryngoscope	250	15	3,750	15	3,750
Cardiotocographe	4,200	2	8,400	0	0
Fetoscope	3	3	9	2	6
Stretcher on wheels	84	3	252	3	252
Radiant warmers	1,600	1	1,600	1	1,600
Closed suction drainage	1,500	1	1,500	1	1,500
Resuscitation equipment (peds)	1,200	3	3,600	2	2,400
Cystoscope (pediatrics)	3,000	1	3,000	1	3,000
Birthing table	3,000	2	6,000	2	6,000
Copy machines	1,000	5	5,000	0	0
Exam table	250	2	500	2	500
Operating table	4,170	3	12,510	2	8,340
Oto-Ophthalmoscope	573	5	2,865	3	1,719
Pulse oximeter	600	10	6,000	10	6,000
Resuscitation equipment (adult)	1,200	3	3,600	1	1,200
Automated Defibrillator	1,884	2	3,768	4	7,536
Caesarian kit	300	4	1,200	3	900
Overhead Projector	300	4	1,200	2	600
Resuscitation cart	2,967	5	14,835	5	14,835
Phototherapy machine	2,000	2	4,000	1	2,000
Neonatal stethoscopes	100	5	500	2	200
Nebulizer	51	10	510	5	255
ECG machine	3,500	2	7,000	1	3,500
Nursing trolley	300	4	1,200	4	1,200
Pulse Oximeter (peds)	600	2	1,200	3	1,800

Blood pressure cuff (peds)	40	5	200	5	200
Suction	100	10	1,000	10	1,000
Surgical suction	1,470	4	5,880	4	5,880
Uretrotome (with accessories)	500	1	500	0	0
Vacuum extractor	87	2	174	1	87
Ventilator (pediatric)	2,500	2	5,000	1	2,500
Maintenance Supplies	1,000	3	2,500	10	10,000
Construction			**733,700**		**0**
Hospital Upgrades	183,425	4	733,700	0	0
Dining room/refectory	40,020	1	40,020	0	0
Neonatal Intensive Care Unit	26,680	1	26,680	0	0
On call dormitory (capacity 20)	133,400	1	133,400	0	0
Student dormitory (80 beds)	533,600	1	533,600	0	0
Other Direct Costs			**2,000**		**215,778**
Infrastructure/Equipment Maintenance			0		213,778
Training for Maintenance Staff	1,000	2	2,000	2	2,000
Grand Total			**2,699,545**		**767,338**

a. Personnel

The salary for two members of staff to focus on maintenance of hospital equipment has been included to ensure that the additional equipment being purchased for CHUK under this proposal will be well maintained. These people will join the existing small maintenance team at CHUK. Training for this person has been included under the "Training" section.

b. Equipment and supplies

In order to provide high quality teaching, CHUK must have the equipment necessary to provide adequate services in each specialty being taught. Supplies and equipment costs for CHUK were calculated based on a preliminary needs assessment, an inventory, verification with relevant leadership, and pricing using the ECRI database and SPIU standards.

In discussion groups during the May 2011 Consortium meeting with US and Rwandan faculty, key supplies and equipment needed to train students in clinical settings were identified by specialty and program. A list of requirements was first established considering capacity needs in terms of patient volumes, teaching requirements and specific service delivery requirements. The number of students and faculty per facility was also considered. This preliminary needs assessment formed the basis for the inventory form listing the equipment required at CHUK. These inventories were then completed by MoH personnel with the management of CHUK, determining if or how many of a given item the hospital currently had, and how many it would require based on the number of students expected and the patient load and the gap per year.

Equipment was assigned to a budget year based on the schedule for upgrades by specialty or program. The final equipment list and procurement schedule was then reviewed and verified by the Director General of CHUK. The equipment was then priced using the ECRI database and, when items were not available, through medical supply companies and consultation with medical practitioners.

c. Construction

The process to evaluate infrastructure requirements was similar to what was done for equipment. During the drafting of individual infrastructure was done in collaboration between US faculty, MoH staff, and facility management. A list of requirements was first established considering capacity needs in terms of patient volumes, teaching space requirements and specific service delivery requirements. Based on this list, a facility assessment was performed to evaluate existing infrastructure capacity and identify gaps. Using the implementation schedule and the required capacity, the construction timing and costing were established. All construction was priced using the SPIU standard price of $667 USD per m2.

d. Other Direct Costs

Other Direct Costs are associated with maintenance of equipment or infrastructure and were included starting in Year Two. For equipment, a flat rate of 10% of all prior equipment investments was included, which will cover costs for replacement parts, transport and goods. For infrastructure, a flat rate of 7.5% of all prior infrastructure investments was included to cover materials, labor and transportation costs. In addition, it was deemed important to include training for maintenance personnel, as current capacity is extremely limited. Ensuring good maintenance and management of equipment by hospital staff is going to be essential for the long-terms sustainability of the program.

2. King Faisal Hospital (KFH)

Table 27. King Faisal Hospital Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**2,500**		**10,000**
Maintenance Staff Salary & Benefits	10,000	0.25	2,500	1	10,000
Equipment			**142,000**		**48,000**
CD4	5,000	1	5,000	0	0
Colonoscope	22,000	1	22,000	0	0
Colposcope	7,000	1	7,000	0	0
Fluoroscope	60,000	1	60,000	0	0
Incubators	16,000	3	48,000	3	48,000
Supplies			**22,000**		**10,250**
Autoclave	2,342	2	4,684	0	0
Dental Chairs	3,000	3	9,000	0	0
LEEP equipment	4,816	1	4,816	0	0
Laryngoscope	250	2	500	1	250
System electrophoresis	500	1	500	0	0
Maintenance Supplies	1,000	3	2,500	10	10,000
Construction			**53,360**		**0**
Neonatal Intensive Care Unit	26,680	1	26,680	0	0
Intensive care unit	26,680	1	26,680	0	0
Other Direct Costs			**1,000**		**19,202**
Infrastructure/Equipment Maintenance			0		18,202
Training for Maintenance Staff	1,000	1	1,000	1	1,000
Grand Total			**220,860**		**87,452**

King Faisal Hospital is the best equipped hospital in the country. It is a private, not for profit hospital located in Kigali which currently serves as the highest referral hospital in Rwanda. As can be seen by comparison with the other referral hospitals, the needs of King Faisal Hospital are more limited.

However, some investments are still necessary for high quality education to take place. These include the construction of neonatal and adult intensive care units.

3. Centre Hospitalier Universitaire de Butare (CHUB)

Table 28. CHUB Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**5,000**		**20,000**
Maintenance Staff Salary & Benefits	10,000	0.5	5,000	2	20,000
Equipment			**1,385,081**		**353,000**
Anesthesia Machine	20,000	3	60,000	2	40,000
Bio-microscope	5,000	1	5,000	1	5,000
Blood gas machine	16,000	2	32,000	0	0
CD4	5,000	1	5,000	0	0
Cell Counter	35,000	2	70,000	0	0
Colonoscope	22,000	2	44,000	2	44,000
Colposcope	7,000	1	7,000	0	0
Cryosurgery equipment	30,000	0	0	1	30,000
Echocardiography machine	11,000	1	11,000	0	0
Laparoscope	20,000	2	40,000	1	20,000
Laser equipment	12,000	1	12,000	0	0
Mammography	30,000	1	30,000	0	0
Portable x-ray machine	10,000	1	10,000	1	10,000
Dermatome	12,000	3	36,000	0	0
Fluoroscope	60,000	1	60,000	1	60,000
Bronchosope (ENT + Accessories)	16,000	2	32,000	0	0
Cardiac Monitor	18,000	10	180,000	2	36,000
Bronchoscope (Pulmonology)	16,000	2	32,000	0	0
Incubator for transfer	13,000	3	39,000	0	0
Electrocautery	6,000	3	18,000	2	12,000
Gastroscope	20,000	3	60,000	1	20,000
Monitors (peds)	12,000	4	48,000	0	0
Cardiac Catheter	20,000	5	100,000	0	0
Incubator	16,000	8	128,000	2	32,000
Surgical light	15,000	4	60,000	0	0
Tissue Embedding Center	12,000	1	12,000	0	0
Tissue Processor (pathology lab)	49,000	1	49,000	0	0
Ultrasound (portable)	44,000	2	88,000	0	0
Ultrasound (radiology)	44,000	1	44,000	1	44,000
Ventilator	10,000	6	60,000	0	0
X-ray machine	13,081	1	13,081	0	0
Supplies	**1,457**		**261,511**		**96,803**
Printers	50	2	100	0	0

Computers	700	20	14,000	10	7,000
Projectors (LCD)	600	4	2,400	4	2,400
Autoclave	2,342	1	2,342	1	2,342
Blood pressure cuff (adult)	40	7	280	8	320
EKG	4,000	3	12,000	0	0
Gynecological table	292	1	292	0	0
Oxygen delivery system	300	1	300	1	300
Precision scale (adult)	735	5	3,675	0	0
Cardiac stress testing treadmill	500	1	500	0	0
CPAP	1,000	2	2,000	0	0
Cystoscope	3,000	1	3,000	0	0
Dental Chairs	3,000	3	9,000	0	0
Hysteroscope	4,500	3	13,500	2	9,000
LEEP equipment	4,816	1	4,816	0	0
Manual tracheal suction	400	5	2,000	3	1,200
microscope	3,000	5	15,000	0	0
Resuscitation equipment (neonatal)	1,200	1	1,200	0	0
spectrophotometer	1,800	1	1,800	1	1,800
Spirometer	2,000	1	2,000	0	0
IV and feeding pumps	2,000	3	6,000	0	0
Laryngoscope	250	2	500	0	0
Cardiotocographe	4,200	3	12,600	3	12,600
Fetoscope	3	7	21	0	0
Precision scale (pediatric)	74	2	148	0	0
Stretcher on wheels	84	3	252	2	168
Cytocentrifuge	4,000	1	4,000	1	4,000
Radiant warmers	1,600	2	3,200	0	0
Closed suction drainage	1,500	2	3,000	0	0
Resuscitation equipment (peds)	1,200	2	2,400	0	0
Birthing table	3,000	3	9,000	1	3,000
Copy machines	1,000	2	2,000	0	0
Exam table	250	3	750	2	500
Operating table	4,170	4	16,680	0	0
Oto-Ophthalmoscope	573	8	4,584	0	0
Pulse oximeter	600	10	6,000	10	6,000
Resuscitation equipment (adult)	1,200	8	9,600	0	0
Automated Defibrillator	1,884	3	5,652	2	3,768
Caesarian kit	300	5	1,500	0	0
Glucometers	20	10	200	0	0
Resuscitation cart	2,967	10	29,670	4	11,868

Phototherapy machine	2,000	3	6,000	0	0
Fetal heart detector	325	3	975	0	0
Oxygen concentrator	500	3	1,500	2	1,000
Nebulizer	51	2	102	2	102
Major surgery kit for opthalmology	475	3	1,425	1	475
Allergy Testing Kit	200	3	600	2	400
Monitor (ICU)	4,200	3	12,600	3	12,600
Blood pressure cuff (peds)	40	6	240	5	200
Surgical suction	1,470	10	14,700	2	2,940
Urogynecology Kit (fistula, cystocel)	2,000	1	2,000	1	2,000
Vacuum extractor	87	1	87	0	0
Ventilator (pediatric)	2,500	4	10,000	0	0
Wheelchair	164	5	820	5	820
Maintenance Supplies	1,000	3	2,500	10	10,000
Construction			**733,700**		**0**
Classroom	26,680	2	53,360	0	0
Dining room/refectory	40,020	1	40,020	0	0
Kitchen and food storage	16,008	1	16,008	0	0
Library	40,020	1	40,020	0	0
Sterilization room	20,010	1	20,010	0	0
Emergency rooms	10,672	1	10,672	0	0
On-call room	4,002	2	8,004	0	0
Operating room	20,010	3	60,030	0	0
Pediatric ward	186,760	1	186,760	0	0
Dentistry room	10,672	2	21,344	0	0
Consultation room	8,338	4	33,350	0	0
Surgical ward	233,450	1	233,450	0	0
Triage room	10,672	1	10,672	0	0
Other Direct Costs			**2,000**		**195,536**
Infrastructure/Equipment Maintenance			0		193,536
Training for Maintenance Staff	1,000	2	2,000	2	2,000
Grand Total			**2,387,292**		**665,339**

a. Personnel

The salary for one member of staff to focus on maintenance of hospital equipment has been included to ensure that the additional equipment being purchased for CHUB under this proposal will be well maintained. This person will join the existing small maintenance team at CHUB.

b. Equipment

Equipment costs in Year One are $1.4 m, but decline to $353,000 in Year Two as implementation activities are underway.

c. Supplies

Similarly, costs for Supplies are higher in Year 1 than in Year 2. Due to the size of the hospital and the number of clinical training programs set to take place there, CHUB requires a substantial investment in supplies.

d. Construction

Infrastructure upgrades at CHUB are limited. In Year One, upgrades will include two new classrooms, three operating rooms, and increased capacity for dentistry rotations. All costs for Construction at CHUB are in Year 1.

e. Other direct costs

Similar to other hospitals, Other Direct Costs for CHUB are devoted to infrastructure and equipment maintenance, including the training of maintenance staff.

4. Kanombe Military Hospital

Table 29. Kanombe Military Hospital, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**5,000**		**20,000**
Maintenance Staff Salary & Benefits	10,000	0.50	5,000	2	20,000
Equipment			**312,000**		**40,000**
Anesthesia Machine	20,000	2	40,000	2	40,000
Blood gas machine	16,000	3	48,000	0	0
Colonoscope	22,000	1	22,000	0	0
Mammography	30,000	1	30,000	0	0
Portable x-ray machine	10,000	1	10,000	0	0
Bronchoscope	16,000	1	16,000	0	0
Cardiac Echocardiography machine	11,000	1	11,000	0	0
Dermatome	12,000	1	12,000	0	0
Portable echo machine	11,000	1	11,000	0	0
Cardiac Monitor	18,000	4	72,000	0	0
Ventilator	10,000	4	40,000	0	0
Supplies			**73,130**		**36,682**
Cardiac stress testing treadmill	500	1	500	0	0
CPAP	1,000	5	5,000	0	0
Cystoscope	3,000	1	3,000	0	0
Dental Chairs	3,000	3	9,000	0	0
LEEP equipment	4,816	1	4,816	0	0
Cardiotocographe	4,200	6	25,200	0	0
Fetoscope	3	3	9	4	12
Radiant warmers	1,600	5	8,000	5	8,000
Operating table	4,170	1	4,170	1	4,170
Phototherapy	2,000	4	8,000	4	8,000
Oxygen concentrator	500	0	0	3	1,500
Vacuum extractor	87	5	435	0	0
Ventilator (pediatric)	2,500	1	2,500	2	5,000
Maintenance Supplies	1,000	3	2,500	10	10,000
Construction			**10,672**		**0**
Computer lab	10,672	1	10,672	0	0
Other Direct Costs			**2,000**		**34,000**
Infrastructure/Equipment Maintenance			0		32,000
Training for Maintenance Staff	1,000	2	2,000	2	2,000
Grand Total			**402,802**		**130,682**

a. Personnel

The salary for two staff members to maintain hospital equipment is provided in the KMH budget. Annual training for these individuals has been included under the “Training” section.

b. Equipment

Supplies and equipment costs for KMH were calculated based on a preliminary needs assessment and pricing using the ECRI database and SPIU standards. The final equipment list and procurement schedule was then reviewed and verified by the Clinical Director at KMH.

Equipment costs for KMH are higher in Year One because the deployment schedule for US faculty. It is anticipated that four main residency programs and dentistry will begin rotations at KMH in July 2012.

c. Supplies

Supply costs are highest in Year One and scale-down in Year Two. Supplies are requested to facilitate new training programs.

d. Construction

There will be construction of one computer lab. Construction was priced using the SPIU standard price of 667 USD per m2. By the end of 2011, KMH will be established as a referral hospital. Due to the planned upgrade, the total budget for KMH is lower than the other referral hospitals because infrastructure and equipment upgrades are already in process.

e. Other Direct Costs

Other Direct Costs include maintenance for equipment and infrastructure, calculated at the standard rate 7.5% of Construction investments and 10% for Equipment investments from each previous year.

5. Kibagabaga Provincial Hospital

Table 30. Kibagabaga Hospital Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**0**		**2,500**
Maintenance Staff Salary & Benefits	10,000	0	0	0.25	2,500
Equipment			**0**		**421,081**
Anesthesia Machine	20,000	0	0	1	20,000
Bio-microscope	5,000	0	0	2	10,000
Blood gas machine	16,000	0	0	1	16,000
CD4	5,000	0	0	1	5,000
Cell Counter	35,000	0	0	1	35,000
Colposcope	7,000	0	0	1	7,000
Portable x-ray machine	10,000	0	0	1	10,000
Bronchoscope	16,000	0	0	1	16,000
Dermatome	12,000	0	0	1	12,000
Cardiac Monitor	18,000	0	0	1	18,000
Fetal monitors (portable)	5,000	0	0	1	5,000
Fetal monitors (stationary)	5,000	0	0	1	5,000
Operating microscope (ophthalmology)	25,000	0	0	1	25,000
Incubators	16,000	0	0	2	32,000
Surgical light	15,000	0	0	4	60,000
Ultrasound (portable)	44,000	0	0	1	44,000
Ultrasound (radiology)	44,000	0	0	1	44,000
Ultrasound (stationary)	44,000	0	0	1	44,000
X-ray machine	13,081	0	0	1	13,081
Supplies			**0**		**179,031**
Printers	50	0	0	2	100
Computers	700	0	0	15	10,500
Autoclave	2,342	0	0	2	4,684
Blood pressure cuff (adult)	40	0	0	15	600
EKG	4,000	0	0	1	4,000
Gynecological table	292	0	0	3	876
Oxygen delivery system	300	0	0	1	300
Precision scale (adult)	735	0	0	3	2,205
Cystoscope	3,000	0	0	3	9,000
LEEP equipment	4,816	0	0	2	9,632
Manual tracheal suction	400	0	0	4	1,600
Microscope	3,000	0	0	2	6,000
Resuscitation equipment	1,200	0	0	1	1,200

(neonatal)					
Spectrophotometer	1,800	0	0	1	1,800
Spirometer	2,000	0	0	1	2,000
Major surgery kit for ophthalmology	500	0	0	4	2,000
IV and feeding pumps	2,000	0	0	2	4,000
laparoscopy equipment (diagnostic and low level treatment)	1,000	0	0	1	1,000
Laryngoscope	250	0	0	1	250
Cardiotocographe	4,200	0	0	1	4,200
Fetoscope	3	0	0	5	15
Precision scale (pediatric)	74	0	0	2	148
Stretcher on wheels	84	0	0	1	84
Closed suction drainage	1,500	0	0	2	3,000
Resuscitation equipment (peds)	1,200	0	0	1	1,200
Copy machines	1,000	0	0	1	1,000
Lead screens	188	0	0	1	188
Oto-Ophthalmoscope	573	0	0	6	3,438
Phototherapy	2,000	0	0	3	6,000
Pulse oximeter	600	0	0	4	2,400
Resuscitation equipment (adult)	1,200	0	0	2	2,400
Automated Defibrillator	1,884	0	0	1	1,884
Centrifuge machine (lab)	4,000	0	0	1	4,000
Caesarian kit	300	0	0	2	600
Resuscitation cart	2,967	0	0	6	17,802
Neonatal stethoscopes	100	0	0	2	200
Oxygen concentrator	500	0	0	3	1,500
Nebulizer	51	0	0	3	153
Infusion pump	1,000	0	0	2	2,000
Nursing trolley	300	0	0	10	3,000
Pulse Oximeter (peds)	600	0	0	5	3,000
Ophthalmoscopes	200	0	0	3	600
Radiation pocket sensors	30	0	0	3	90
Blood pressure cuff (peds)	40	0	0	10	400
Oxygen cylinder	300	0	0	6	1,800
Appropriate tools for orthopedics (e.g. plates, screws, nails)	1,500	0	0	25	37,500
Surgical suction	1,470	0	0	5	7,350
Vacuum extractor	87	0	0	4	348
Ventilator (pediatric)	2,500	0	0	3	7,500
Wheelchair	164	0	0	6	984
Maintenance Supplies	1,000	0	0	3	2,500

Construction			**0**		**1,080,540**
Classroom	26,680	0	0	1	26,680
Faculty office	10,672	0	0	2	21,344
Library	40,020	0	0	1	40,020
Emergency rooms	10,672	0	0	1	10,672
Operating room	20,010	0	0	1	20,010
Pediatric ward	186,760	0	0	1	186,760
Computer lab	10,672	0	0	1	10,672
Radiology room	20,010	0	0	1	20,010
Student dormitory (20 beds)	133,400	0	0	1	133,400
Dentistry room	10,672	0	0	1	10,672
Maternity ward	280,140	0	0	1	280,140
Delivery room	26,680	0	0	1	26,680
Family planning room	8,004	0	0	1	8,004
Pharmacy	10,672	0	0	1	10,672
Consultation room	8,338	0	0	4	33,350
Surgical ward	233,450	0	0	1	233,450
Ultrasound room	8,004	0	0	1	8,004
Other Direct Costs			**0**		**1,000**
Training for Maintenance Staff	1,000		0		1,000
Grand Total			**0**		**1,684,152**

a. Personnel

Costs for Kibagabaga Hospital are for equipment maintenance personnel. The staff costs begin in the fourth quarter of Year Two, thus totaling only $2500 for Years One and Two.

b. Equipment

Costs for Kibagabaga are zero in Year One, but scale up in Year Two to prepare the site to provide a high-quality training environment for students. The total cost of Equipment in Year Two is $421,081.

c. Supplies

The total for supplies is $179,031 in Year Two (and are zero in Year One, before clinical rotations begin at the hospital). Supplies are critical to enable on-site learning for students. As with all hospital supplies, quantities were determined based on both patient and student volume estimates.

d. Construction

The major cost driver of the Kibagabaga Hospital budget for Years One and Two. The Hospital infrastructure will be significantly upgraded to support student education, including such costs to equip the hospital for new residency training, and constructing a student dormitory to decrease financial and

logistical burdens on students. The total cost of construction for the two years will be $1,080,540.

e. Other Direct Costs

The Other Direct Costs at Kibagabaga are only $1000 in Years One and Two, dedicated to training maintenance staff for new equipment, beginning only in Year Two.

6. Ruhengeri Provincial Hospital

Table 31. Ruhengeri Hospital Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**2,500**		**10,000**
Maintenance Staff Salary & Benefits	10,000	0.25	2,500	1	10,000
Equipment			**678,081**		**125,000**
Anesthesia Machine	20,000	4	80,000	0	0
Bio-microscope	5,000	2	10,000	2	10,000
Blood gas machine	16,000	1	16,000	1	16,000
CD4	5,000	1	5,000	0	0
Cell Counter	35,000	2	70,000	0	0
Colonoscope	22,000	1	22,000	0	0
Colposcope	7,000	1	7,000	0	0
Cryosurgery equipment	30,000	1	30,000	0	0
Laparoscope	20,000	1	20,000	0	0
Laser equipment	12,000	1	12,000	0	0
Mammography	30,000	1	30,000	0	0
Portable x-ray machine	10,000	1	10,000	0	0
Bronchoscope	16,000	1	16,000	0	0
Dermatome	12,000	1	12,000	0	0
Cardiac Monitor	18,000	3	54,000	2	36,000
Incubators	16,000	5	80,000	3	48,000
Surgical light	15,000	1	15,000	1	15,000
Ultrasound (portable)	44,000	2	88,000	0	0
Ultrasound (radiology)	44,000	2	88,000	0	0
X-ray machine	13,081	1	13,081	0	0
Supplies			**164,669**		**58,760**
Printers	50	6	300	0	0
Computers	700	36	25,200	0	0
Projectors (LCD)	600	1	600	0	0
Blood pressure cuff (adult)	40	20	800	10	400
EKG	4,000	5	20,000	3	12,000
Oxygen delivery system	300	2	600	0	0
Precision scale (adult)	735	4	2,940	3	2,205
CPAP	1,000	4	4,000	0	0
Cystoscope	3,000	1	3,000	0	0
Dental Chairs	3,000	3	9,000	0	0
LEEP equipment	4,816	1	4,816	0	0
microscope	3,000	1	3,000	1	3,000
Resuscitation equipment (neonatal)	1,200	1	1,200	1	1,200

spectrophotometer	1,800	1	1,800	1	1,800
Spirometer	2,000	1	2,000	0	0
Major surgery kit for ophthalmology	500	2	1,000	2	1,000
Dormitory beds	100	40	4,000	0	0
IV and feeding pumps	2,000	2	4,000	2	4,000
Laryngoscope	250	2	500	0	0
Cardiotocographe	4,200	1	4,200	0	0
Fetoscope	3	1	3	0	0
Precision scale (pediatric)	74	2	148	1	74
Stretcher on wheels	84	2	168	1	84
Radiant warmers	1,600	2	3,200	0	0
Closed suction drainage	1,500	4	6,000	0	0
Resuscitation equipment (peds)	1,200	2	2,400	2	2,400
Birthing table	3,000	1	3,000	1	3,000
Copy machines	1,000	2	2,000	0	0
Exam table	250	2	500	0	0
Lead screens	188	2	376	0	0
Operating table	4,170	2	8,340	0	0
Oto-Ophthalmoscope	573	2	1,146	0	0
Resuscitation equipment (adult)	1,200	1	1,200	1	1,200
Automated Defibrillator	1,884	2	3,768	0	0
Caesarian kit	300	2	600	0	0
Resuscitation cart	2,967	4	11,868	3	8,901
Minor surgery kit for ophthalmology	100	2	200	1	100
Oxygen concentrator	500	3	1,500	0	0
Nebulizer	51	2	102	2	102
Nursing trolley	300	3	900	3	900
Blood pressure cuff (peds)	40	20	800	10	400
Vacuum extractor	87	2	174	2	174
Ventilator (pediatric)	2,500	8	20,000	2	5,000
Wheelchair	164	5	820	5	820
Maintenance Supplies	1,000	3	2,500	10	10,000
Maintenance Supplies	1,000	3	2,500	10	10,000
Construction			**748,374**		**8,004**
Classroom	26,680	2	53,360	0	0
Faculty office	10,672	2	21,344	0	0
Library	40,020	1	40,020	0	0
Sterilization room	20,010	1	20,010	0	0
Emergency rooms	10,672	2	21,344	0	0
On-call room	4,002	4	16,008	0	0
Pediatric ward	186,760	1	186,760	0	0

Computer lab	10,672	1	10,672	0	0
Faculty dormitory (10 beds)	66,700	1	66,700	0	0
Dentistry room	10,672	1	10,672	0	0
Delivery room	26,680	1	26,680	0	0
Student dormitory (40 beds)	266,800	1	266,800	0	0
Ultrasound room	8,004	1	8,004	1	8,004
Other Direct Costs			**1,000**		**124,936**
Infrastructure/Equipment Maintenance			0		123,936
Training for Maintenance Staff	1,000	1	1,000	1	1,000
Grand Total			**1,594,624**		**326,700**

a. Personnel

The only personnel at Ruhengeri Hospital will be equipment maintenance staff. These costs begin in the fourth quarter of Year One, thus totaling $12,500 for Years One and Two.

b. Equipment

Ruhengeri will be upgraded in Year One, incurring significant equipment costs that year ($678,081), with decreasing costs in Year Two ($125,000) as the upgrade is completed. Significant cost contributors in this category include equipment for obstetrics/gynecology and pediatrics rotations that will be completed at Ruhengeri, including incubators, mammography, and ultrasounds.

c. Supplies

At Ruhengeri, supplies follow the upgrade schedule, contributing significantly to the budget in Year 1, with $164,669, and tapering down in Year 2 to about one third of Year One costs.

d. Construction

Construction is the major cost driver of the Ruhengeri Hospital budget for Year One, when nearly all of the infrastructure investments will be made, with a cost of $748,374. Major costs in this category include constructing a student dormitory to decrease financial and logistical burdens on students, as well as constructing a pediatric ward to handle the patient load and provide quality training for the pediatrics and FAMCO postgraduates.

e. Other Direct Costs

There are no substantial other direct costs at Ruhengeri, with an annual budget of $1000 in this category to train maintenance personal.

7. Kabgayi Provincial Hospital

Table 32. Kabgayi Hospital Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**2,500**		**10,000**
Maintenance Staff Salary & Benefits	10,000	0.25	2,500	1	10,000
Equipment			**545,881**		**108,000**
Anesthesia Machine	20,000	1	20,000	1	20,000
Bio-microscope	5,000	1	5,000	1	5,000
Blood gas machine	16,000	1	16,000	0	0
CD4	5,000	1	5,000	0	0
Cell Counter	35,000	0	0	1	35,000
Colonoscope	22,000	1	22,000	0	0
Colposcope	7,000	1	7,000	0	0
Cryosurgery equipment	30,000	0	0	1	30,000
Portable x-ray machine	10,000	1	10,000	0	0
Dermatome	12,000	1	12,000	0	0
Fluoroscope	60,000	1	60,000	0	0
Ophthalmology scan	5,800	1	5,800	0	0
Cardiac Monitor	18,000	6	108,000	0	0
Electrocautery	6,000	3	18,000	3	18,000
Incubators	16,000	6	96,000	0	0
Surgical light	15,000	4	60,000	0	0
Ultrasound (portable)	44,000	1	44,000	0	0
Ultrasound (stationary)	44,000	1	44,000	0	0
X-ray machine	13,081	1	13,081	0	0
Supplies			**236,671**		**92,365**
Printers	50	2	100	2	100
Computers	700	10	7,000	5	3,500
Projectors (LCD)	600	1	600	1	600
Autoclave	2,342	0	0	1	2,342
Blood pressure cuff (adult)	40	30	1,200	0	0
EKG	4,000	1	4,000	1	4,000
Gynecological table	292	6	1,752	0	0
Oxygen delivery system	300	1	300	0	0
Precision scale (adult)	735	0	0	1	735
CPAP	1,000	1	1,000	0	0
Dental Chairs	3,000	1	3,000	0	0
LEEP equipment	4,816	1	4,816	1	4,816
Manual tracheal suction	400	3	1,200	3	1,200
microscope	3,000	1	3,000	0	0

Resuscitation equipment (neonatal)	1,200	10	12,000	8	9,600
spectrophotometer	1,800	1	1,800	0	0
Spirometer	2,000	1	2,000	0	0
equipment for urogynecology procedures	2,000	3	6,000	2	4,000
Major surgery kit for ophthalmology	500	2	1,000	2	1,000
Blood culture equipment	17	1	17	0	0
CMR	600	1	600	0	0
Coagulation test machine	190	1	190	0	0
IV and feeding pumps	2,000	1	2,000	0	0
Laryngoscope	250	5	1,250	0	0
Cardiotocographe	4,200	5	21,000	5	21,000
Fetoscope	3	5	15	5	15
Precision scale (pediatric)	74	0	0	2	148
Stretcher on wheels	84	2	168	2	168
Radiant warmers	1,600	2	3,200	0	0
Closed suction drainage	1,500	2	3,000	1	1,500
Resuscitation equipment (peds)	1,200	3	3,600	2	2,400
Birthing table	3,000	6	18,000	0	0
Copy machines	1,000	1	1,000	0	0
Exam table	250	2	500	2	500
Lead screens	188	3	564	2	376
Operating table	4,170	5	20,850	0	0
Oto-Ophthalmoscope	573	5	2,865	0	0
Phototherapy	2,000	2	4,000	1	2,000
Pulse oximeter	600	15	9,000	5	3,000
Resuscitation equipment (adult)	1,200	3	3,600	2	2,400
Automated Defibrillator	1,884	1	1,884	1	1,884
equipment for hysteroscopy procedures	2,000	3	6,000	2	4,000
Caesarian kit	300	10	3,000	4	1,200
Glucometers	20	5	100	5	100
Resuscitation cart	2,967	15	44,505	0	0
Neonatal stethoscopes	100	5	500	3	300
Oxygen concentrator	500	10	5,000	5	2,500
Nebulizer	51	5	255	3	153
Nursing trolley	300	10	3,000	7	2,100
Pulse Oximeter (peds)	600	5	3,000	3	1,800
Blood pressure cuff (peds)	40	10	400	0	0
Glucometer strips (#300)	20	5	100	5	100
Kit of osteosynthesis material	500	5	2,500	5	2,500
Surgical suction	1,470	3	4,410	0	0

Vacuum extractor	87	2	174	0	0
Ventilator (pediatric)	2,500	5	12,500	0	0
Wheelchair	164	4	656	2	328
Maintenance Supplies	1,000	3	2,500	10	10,000
Construction			**493,247**		**0**
Student dormitory (50 beds)	333,500	1	333,500	0	0
Library	40,020	1	40,020	0	0
Emergency rooms	10,672	1	10,672	0	0
Neonatal Intensive Care Unit	26,680	1	26,680	0	0
Intensive care unit	26,680	1	26,680	0	0
Radiology room	20,010	1	20,010	0	0
Dentistry room	10,672	1	10,672	0	0
Consultation room	8,338	3	25,013	0	0
Other Direct Costs			**1,000**		**92,582**
Infrastructure/Equipment Maintenance			0		91,582
Training for Maintenance Staff	1,000	1	1,000	1	1,000
Grand Total			**1,279,299**		**302,947**

a. Personnel

Costs for Kabgayi Hospital are for equipment maintenance personnel. The staff costs begin in the fourth quarter of Year Two, thus totaling only $12,500 for Years One and Two.

b. Equipment

Costs for Kabgayi are quite high in Year One when most upgrades will be made, totaling $545,881. They decrease significantly in Year Two. Kabgayi will be the first provincial clinical training sites for surgery, beginning in Year One, and requires significant investment in surgical equipment such as surgical lights.

c. Supplies

A total of $236,671 in supplies are needed for Year One, while the cost tapers to less than half of that in Year Two. Many basic hospital supplies are urgently needed for nursing/midwifery and FAMCO clinical training.

d. Construction

Construction is the major cost driver of the Kabgayi Hospital budget for Years One and Two. Student dorms drive most of this cost, at $333,500 in Year One. An ICU and NICU are also needed, at substantial cost to the program.

e. Other Direct Costs

There are no substantial other direct costs at Kabgayi, with an annual budget of $1,000 in this category to train maintenance personal.

8. Rwamagana Provincial Hospital

Table 33. Rwamagana Hospital Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Personnel			**2,500**		**10,000**
Maintenance Staff Salary & Benefits	10,000	0.25	2,500	1	10,000
Equipment			**217,000**		**163,081**
Anesthesia Machine	20,000	2	40,000	2	40,000
Bio-microscope	5,000	1	5,000	1	5,000
Blood gas machine	16,000	2	32,000	0	0
CD4	5,000	0	0	1	5,000
Colposcope	7,000	0	0	1	7,000
Mammography	30,000	0	0	1	30,000
Portable x-ray machine	10,000	1	10,000	1	10,000
Bronchoscope	16,000	0	0	1	16,000
Dermatome	12,000	1	12,000	1	12,000
Cardiac Monitor	18,000	6	108,000	0	0
Surgical light	15,000	0	0	1	15,000
Ventilator	10,000	1	10,000	1	10,000
X-ray machine	13,081	0	0	1	13,081
Supplies			**111,592**		**88,474**
Printers	50	1	50	1	50
Computers	700	0	0	12	8,400
Projectors (LCD)	600	1	600	0	0
Autoclave	2,342	2	4,684	0	0
Blood pressure cuff (adult)	40	10	400	10	400
Gynecological table	292	3	876	1	292
Oxygen delivery system	300	1	300	0	0
Precision scale (adult)	735	5	3,675	2	1,470
CPAP	1,000	1	1,000	2	2,000
Cystoscope	3,000	0	0	2	6,000
Dental Chairs	3,000	0	0	3	9,000
Resuscitation equipment (neonatal)	1,200	1	1,200	1	1,200
Dormitory beds	100	25	2,500	15	1,500
IV and feeding pumps	2,000	2	4,000	0	0
Laryngoscope	250	5	1,250	2	500
Cardiotocographe	4,200	4	16,800	3	12,600
Fetoscope	3	10	30	0	0
Precision scale (pediatric)	74	2	148	0	0
Stretcher on wheels	84	4	336	3	252

Radiant warmers	1,600	3	4,800	1	1,600
Resuscitation equipment (peds)	1,200	1	1,200	2	2,400
Birthing table	3,000	3	9,000	0	0
Copy machines	1,000	1	1,000	0	0
Exam table	250	5	1,250	2	500
Operating table	4,170	2	8,340	1	4,170
Oto-Ophthalmoscope	573	2	1,146	1	573
Phototherapy	2,000	2	4,000	1	2,000
Pulse oximeter	600	10	6,000	0	0
Resuscitation equipment (adult)	1,200	1	1,200	1	1,200
Automated Defibrillator	1,884	4	7,536	2	3,768
Caesarian kit	300	2	600	1	300
Overhead Projector	300	1	300	1	300
Resuscitation cart	2,967	5	14,835	3	8,901
Nebulizer	51	5	255	0	0
Nursing trolley	300	6	1,800	2	600
Automatic tracheal suction	300	2	600	2	600
Gynecological Lamp	1,000	3	3,000	3	3,000
Blood pressure cuff (peds)	40	10	400	10	400
Surgical suction	1,470	0	0	1	1,470
Thoracic drainage	200	2	400	1	200
Vacuum extractor	87	3	261	0	0
Ventilator (pediatric)	2,500	1	2,500	1	2,500
Wheelchair	164	5	820	2	328
Maintenance Supplies	1,000	3	2,500	10	10,000
Construction			**1,021,844**		**426,213**
Classroom	26,680	1	26,680	0	0
Dining room/refectory	40,020	1	40,020	0	0
Faculty office	10,672	2	21,344	2	21,344
Kitchen and food storage	16,008	1	16,008	1	16,008
Sterilization room	20,010	2	40,020	0	0
On-call room	4,002	2	8,004	0	0
Operating room	20,010	1	20,010	2	40,020
Computer lab	10,672	1	10,672	0	0
Burn unit	26,680	1	26,680	0	0
Dentistry room	10,672	1	10,672	0	0
Delivery room	26,680	1	26,680	1	26,680
Student dormitory (40 beds)	266,800	1	266,800	0	0
Adult intensive care unit	26,680	0	0	1	26,680
Advanced pediatric unit	26,680	1	26,680	0	0
Maternity waiting room	10,672	0	0	1	10,672

Neonatology Ward	186,760	1	186,760	0	0
Pediatric intensive care unit	26,680	1	26,680	0	0
Post-operative unit	8,004	0	0	1	8,004
Pre-operative room	8,004	0	0	1	8,004
Septic surgery ward	233,450	1	233,450	0	0
Isolation units for contaminating diseases	8,004	2	16,008	0	0
Small surgery room	8,004	1	8,004	1	8,004
Consultation room	8,338	0	0	2	16,675
Surgical ward	233,450	0	0	1	233,450
Triage room	10,672	1	10,672	1	10,672
Other Direct Costs			**1,000**		**99,338**
Infrastructure/Equipment Maintenance			0		98,338
Training for Maintenance Staff	1,000	1	1,000	1	1,000
Grand Total			**1,353,936**		**787,106**

a. Personnel

Personnel costs for Rwamagana Hospital for Years One and Two are dedicated to maintenance staff, at $2,500 in Year One and $10,000 in Year Two. Costs are lower in Year One because the staff does not join until the 4th quarter of the year.

b. Equipment

Rwamagana Hospital will be a crucial clinical training site for all health cadre education programs. For this reason, there are significant investments in equipment in both Year One and Year Two. Equipping Rwamagana Hospital with anesthesia and mammography capability is one major driver of equipment costs, as well as providing a sufficient quantity of cardiac monitors. Each item in the budget is critical to improving education and patient care.

c. Supplies

Similar to Equipment, the costs for Supplies are highest in Year One, decreasing in Year Two. While there are many different supply needs for the multiple training programs at Rwamagana, the Equipment, Supplies, and Construction related to upgrading the site for Surgery residency education is a major contributor to the upgrade costs in Years One and Two.

d. Construction

There are substantial infrastructure upgrades needed at Rwamagana to accommodate the increase in students and faculty associated with the HRH Program. Upfront investment in Year One totals $1m, and then drops to $426,213 in Year Two. Infrastructure such as surgical and neonatology wards are critical to train physician specialists.

e. Other Direct Costs

Other Direct Costs are associated with maintenance of equipment and infrastructure. As with other hospitals, maintenance staff require training, and maintenance and equipment costs are calculated based on the total investment in Construction and Equipment per year. The total costs are $1,000 for Year One and $99,138 for Year Two.

9. Byumba, Kibungo, and Nyagatare District Hospitals

Table 34. Byumba, Kibungo, and Nyagatare Hospitals Budget, Year One to Year Two

Cost Category/Item	Avg. Unit Cost	Yr 1 Quantity	Yr 1 Cost	Yr 2 Quantity	Yr 2 Cost
Equipment			**295,243**		**104,000**
Incubators	16,000	11	176,000	4	64,000
Ventilator	10,000	8	80,000	4	40,000
Supplies			**158,163**		**84,146**
Printers	50	15	750	0	0
Computers	700	25	17,500	5	3,500
Projectors (LCD)	600	10	6,000	1	600
Autoclave	2,342	3	7,026	3	7,026
Blood pressure cuff (adult)	40	12	480	6	240
EKG	4,000	4	16,000	1	4,000
Gynecological table	292	9	2,628	0	0
Oxygen delivery system	300	9	2,700	6	1,800
Precision scale (adult)	735	6	4,410	0	0
Precision scale (pediatric)	74	6	444	0	0
Stretcher on wheels	84	6	504	0	0
Radiant warmers	1,600	6	9,600	6	9,600
Birthing table	3,000	5	15,000	3	9,000
Exam table	250	6	1,500	3	750
Oto-Ophthalmoscope	573	9	5,157	6	3,438
Pulse oximeter	600	6	3,600	6	3,600
Resuscitation equipment (adult)	1,200	6	7,200	3	3,600
Caesarian kit	300	12	3,600	6	1,800
Glucometers	20	9	180	0	0
Oxymeters	500	5	2,500	4	2,000
Suction catheters	100	6	600	3	300
Oxygen concentrator	500	6	3,000	6	3,000
Nebulizer	51	6	306	6	306
Nursing trolley	300	9	2,700	6	1,800
Blood pressure cuff (peds)	40	12	480	6	240
Bedpans/urinary pans	30	18	540	15	450
Gloves	10	90	900	90	900
Thermometers	5	90	450	90	450
Trays & kidney dishes	10	60	600	60	600
Vacuum extractor	87	6	522	3	261
Ventilator (pediatric)	2,500	9	22,500	6	15,000
Wheelchair	164	6	984	6	984
Construction			**993,830**		**130,732**

Classroom	26,680	7	186,760	1	26,680
Dining room/refectory	40,020	3	120,060	0	0
Faculty office	10,672	6	64,032	1	10,672
Kitchen and food storage	16,008	3	48,024	0	0
Library	40,020	3	120,060	0	0
Sterilization room	20,010	7	140,070	1	20,010
Dentistry room	10,672	4	42,688	1	10,672
Delivery room	26,680	5	133,400	0	0
Family planning room	8,004	2	16,008	4	32,016
Triage room	10,672	4	42,688	1	10,672
Wound dressing room	20,010	4	80,040	1	20,010
Grand Total			**1,447,236**		**318,878**

a. Equipment and Supplies

Each of the five nursing schools has an associated hospital where the clinical training of nurses will take place. Two of these hospitals are provincial hospitals (Rwamagana and Kabgayi) whose needs, for the nursing program included, are detailed in the previous section on provincial hospitals. This section details the needs for the three remaining district hospitals which will serve as venues for clinical teaching for nurses. The equipment listed is therefore specific to this purpose. The process to evaluate equipment requirements was as for referral and provincial hospitals.

b. Construction

The additional requirements for these three district hospitals in terms of additional infrastructure to meet the needs of the program are similar and have therefore been grouped together. The process to evaluate infrastructure requirements was as for referral and provincial hospitals.

D. US Academic Partners

The presence of full time US faculty in both the educational institutions and the clinical training sites is a critical component of the HRH Program. US faculty will be taking substantial pay cuts to participate, and these reduced salaries are fully covered through the HRH Program. A total of 609 FTE's will be included in the HRH Program over eight years. The number of FTEs peaks in Year Three and slowly diminishes thereafter, reflecting the phase out of US faculty involvement in the Rwandan health education system as Rwandan teachers and mentors take their place. FTEs include faculty in each of the programs and specialties addressed through the HRH Program. The number of FTEs for each of these programs was calculated based on a number of factors: student--teacher ratio, number and skill-level of current Rwandan faculty, number of clinical training sites, and the amount of subspecialty or modular training required.

During the May 2011 Consortium meeting in Kigali, US and Rwandan faculty met in their specialty or program groups and determined the number of faculty needed to staff programs capable of producing sufficient numbers of well trained graduates. One main consideration was the number of clinical training sites. In the case of physician specialties, at least one US faculty was designated for each clinical training site. In the case of nurses, at least one US faculty member was designated to serve at the principal training sites.

A second consideration was the desired student-teacher ratio, and thus additional US faculty were assigned to larger clinical training sites with more students. Existing Rwandan faculty and their capacity to teach the subjects in the proposed curricula were also considered. Where faculty where insufficient in quantity, or would require significant mentoring to provide quality teaching, additional US faculty were designated to fill gaps, as in dentistry.

Finally, for physician subspecialties, very specialized expertise is needed. In some cases, this will be delivered in a modular format until Rwandan faculty can be trained in each of these areas. Since these sub-specialists will be short-term topical instructors rather than longer-term clinical mentors, covering these topic areas requires some additional FTEs, as in the internal medicine subspecialties.

The US faculty will engage early on in the HRH Program to help develop curricula, plan clinical rotations and prepare clinical training sites, and coordinate with Rwandan colleagues. This will occur prior to deployment in the teaching institutions, during the nine-month Planning Phase that will commence immediately upon the award of funding. Additional US support staff will also help to prepare the program on the US side. The salaries for these individuals, travel, and other related expenses are included in this budget. During implementation of the project, given the pay cuts that faculty will be accepting to join the program, additional recruitment incentives will be important to attract top quality faculty, such as their housing in Rwanda and similar costs. These recruitment costs are included in this budget.

Table 35. US Academic Partners Budget, Year One to Year Two

	Yr 1 FTEs	Yr 1 Cost	Yr 2 FTEs	Yr 2 Cost
Personnel		**4,493,839**		**12,351,105**
Physicians	23.0	2,634,420	61.3	7,574,355
Nursing & Midwifery	15.2	1,441,579	42.7	3,787,890
Dentistry	1.5	153,210	2.5	271,590
Health Management	2.5	208,920	6.5	494,430
Cross-Cutting Faculty	0.5	55,710	2.0	222,840
Travel		**572,586**		**565,000**
Airfare for Faculty		**382,500**		**390,000**
Physicians		212,500		237,500
Nursing & Midwifery		125,000		107,500
Dentistry		7,500		7,500
Health Management		32,500		32,500
Cross-Cutting Faculty		5,000		5,000
Airfare for families		**160,000**		**175,000**
Planning meetings		**30,086**		**0**
Other Direct Costs		**537,002**		**2,018,909**
Insurance for families		**396,742**		**2,005,259**
Logistical Costs for Planning and System Strengthening Activities		**31,500**		**13,650**
Physicians		23,100		11,550
Nursing & Midwifery		4,200		0
Dentistry		2100		1050
Health Management		2,100		1,050
Pre-Award Reimbursements		**108,760**		**0**
Physicians		75560		0
Nursing & Midwifery		23240		0
Dentistry		6640		0
Health Management		3320		0
Indirect Costs		**293,055**		**780,920**
Grand Total		**5,896,481**		**15,715,934**

a. Personnel

Salary, benefits, and housing stipends will be provided for faculty from the US Academic Consortium. Year One includes 43 FTEs, with 16.2 dedicated to Planning and Systems Strengthening Activities beginning October 1, 2011 – September 30, 2012, and an additional 26.5 FTEs representing the first quarter of the Academic Year that runs from July 2012 – June 2013. Year Two includes 115 FTEs, including 6.5 FTEs for Planning and Systems Strengthening and 108.5 dedicated to Implementation activities. The total Personnel cost for Year One is $4.5m and $12.4m for Year Two.

All salaried US doctors, dentists, health management faculty, and nurse educators will receive a salary and benefits package of $97,500/year, nurse mentors will receive a salary/benefits package of $67,500/year, surgeons will receive a salary/benefits package of $147,500/year, and rotating subspecialists will receive a salary determined on a case by case basis. Benefits typically include health insurance, life insurance, medical evacuation insurance, and disability insurance, as is standard to most university benefits packages.

Personnel also includes housing stipends for US faculty living in Rwanda for at least one year. The cost of housing stipends was set at set at a rate of $1,000/month for faculty without partners or children, $1,300 for faculty with partners, and $1,700 for faculty with children for

all salaried US faculty. The cost of stipends was determined through a market survey of housing costs in Rwanda.

b. Travel

Travel includes airfare for US faculty and their families, at a standard rate of $2500 per round-trip ticket from the US to Rwanda. In general, each US faculty position (whether devoted to system strengthening activities or implementation activities) is budgeted for 1 ticket for each year of participation in the program. Exceptions include two rotating health management positions and the four rotating medical subspecialty positions, which will be allocated 4 tickets per year each. Additional funds are allocated for couples and families of US faculty deployed for program implementation. To include costs for families, it is assumed that an average 30% of US faculty will require 1 additional plane ticket per year, and an average 10% of US faculty will require 3 additional plane tickets per year budgeted at the standard rate of $2,500 per round-trip ticket.

These travel costs also include funds for domestic travel for 14 US Academic Consortium FTEs from the Nursing and Midwifery Schools to attend a planning meeting in Boston. In addition, funds will be allocated for 7 US Nursing and Midwifery faculty members to attend a planning meeting in Rwanda. These costs include cover airfare, hotels, and meeting expenses.

c. Other Direct Costs

Health insurance for families: Using the assumption that 30% of US faculty would have one dependent and 10% would have three dependents, this cost is the health insurance for these dependents.

- **Logistical costs for planning and system strengthening activities:** Short-term accommodation costs will be included for US faculty members deployed for Planning and Systems Strengthening activities.
- **Pre-Award Reimbursement:** Reimbursement for costs already incurred by the US academic partners to send representatives to two meetings for **the HRH Program**: One in Boston on April 5th, 2011, and the other in Rwanda from May 9th – 14^{t,h}, 2011. The amounts for reimbursement were reported directly by the academic partners. The reimbursements will be paid in Year One if permission to charge pre-award costs to the award is granted.

d. Indirect Costs

As described in the proposal narrative, indirect cost recovery for participating US academic institutions is limited to 7% of salaries and wages direct charged to the award.

A. Faculty from the US Academic Consortium, Years One to Eight

Personnel from the US Academic Consortium are the single largest cost in the HRH Program. For this reason, further detail is provided on the distribution and timing of US Institution FTE's over the full grant period. The number of FTEs from the US Academic Consortium is lowest in Year One, when faculty are focused on Planning and Systems Strengthening Activities. FTEs then scale up in Year Two and Three, before beginning to scale down. In Year Eight, there are only 25 FTEs from the US Academic Consortium, as capacity will have been almost completely transferred to Rwandan Partners. In the

table below, FTEs are shown by Planning and Systems Strengthening Activities and Implementation, as well as broken down by Health Cadre.

Table 36. Two US FTEs, Year One to Year Eight

Activity Type	Cadre/Program	Yr 1 - FTEs	Yr 2 - FTEs	Yr 3 - FTEs	Yr 4 - FTEs	Yr 5 - FTEs	Yr 6 - FTEs	Yr 7 - FTEs	Yr 8 - FTEs	Total
PLANNING & SYSTEM STRENGTHENING	Physicians	9.5	4.8	0.0	0.0	0.0	0.0	0.0	0.0	14
	Nursing & Midwifery	4.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	5
	Dentistry	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2
	Health Management	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2
	Planning & System Strengthening Total	**16.2**	**6.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**23**
IMPLEMENTATION	**Physicians**	**13.5**	**56.5**	**65.0**	**62.3**	**51.5**	**40.8**	**27.0**	**11.3**	**328**
	Anesthesiology	1.0	4.0	4.0	3.5	2.0	2.0	1.8	0.8	19
	Emergency Medicine	0.0	0.5	2.0	2.0	1.8	1.0	1.0	0.8	9
	ENT	0.0	0.5	2.0	2.0	2.0	2.0	1.8	0.8	11
	FAMCO	1.5	6.0	6.0	6.0	5.5	3.5	1.8	0.8	31
	Internal Medicine	2.8	11.0	11.0	10.5	8.5	6.5	4.3	1.5	56
	Neurology	0.0	0.5	2.0	2.0	2.0	2.0	1.8	0.8	11
	Ob/Gyn	2.3	9.0	9.0	8.5	6.5	4.5	2.8	1.5	44
	Oncology	0.3	1.3	2.0	2.0	2.0	1.8	0.8	0.0	10
	Orthopedics	0.0	0.3	2.0	2.0	2.0	1.8	1.0	0.8	10
	Pathology	0.3	1.3	2.0	2.0	2.0	1.8	1.0	0.8	11
	Pediatrics	2.5	10.0	10.0	9.5	7.5	5.8	4.3	1.5	51
	Psychiatry	0.3	1.0	1.0	1.0	1.0	1.0	0.8	0.0	6
	Radiology	0.3	1.3	2.0	2.0	2.0	1.8	0.8	0.0	10
	Surgery	2.5	10.0	10.0	9.3	6.8	5.5	3.5	1.5	49
	Nursing & Midwifery	**10.5**	**42.0**	**41.5**	**38.0**	**31.0**	**26.8**	**21.5**	**12.8**	**224**
	A0 & Master's-Level Nursing Educatio	0.3	1.0	1.0	1.0	1.0	1.0	1.0	0.8	7
	A1 Nursing & Midwifery Education	1.3	5.0	5.0	5.0	5.0	5.0	5.0	3.8	35
	Clinical Nursing Mentorship	8.0	32.0	31.5	28.3	22.3	19.0	14.8	8.3	164
	National-Level Nursing Support	1.0	4.0	4.0	3.8	2.8	1.8	0.8	0.0	18
	Dentistry	**0.5**	**2.0**	**2.0**	**2.0**	**2.0**	**1.8**	**1.0**	**0.8**	**12**
	Health Management	**1.5**	**6.0**	**5.5**	**3.0**	**0.0**	**0.0**	**0.0**	**0.0**	**16**
	Cross-Cutting Faculty	**0.5**	**2.0**	**1.8**	**1.0**	**1.0**	**0.8**	**0.0**	**0.0**	**7**
	Implementation Total	**26.5**	**108.5**	**115.8**	**106.3**	**85.5**	**70.0**	**49.5**	**24.8**	**587**
GRAND TOTAL		**43**	**115**	**116**	**106**	**86**	**70**	**50**	**25**	**609**

Sustainability

Appendix 2

Appendix 2. Sustainability

This appendix explains how the program will be sustained including numbers of faculty educated, steady state size of the Rwanda health education system beyond the seven years (after getting over the initial investment build up), how the expenditures necessary to maintain that size can fit within the Rwanda GNP and the African Union commitment on health spending levels.

I. Concept

The HRH Program will significantly increase the numbers of doctors, nurses, oral health professionals and health managers that will be available to the public health sector of Rwanda. The goal of the HRH Program is to fund the mechanism required to increase substantially the numbers of trained personnel in the health sector in an accelerated timeframe. This requires higher levels of investment for a number of years to create a critical mass of health professionals and health faculties and to equip the schools and hospitals. After this initial surge of investment, lower levels of ongoing expenditures will be required to sustain what has been created.

Primarily, this means funding the visiting faculty from the US Academic Consortium who will teach and mentor Rwandan doctors, nurses, dentists and health managers as well as infrastructure and equipment upgrades at hospitals and schools where teaching will take place. These costs will phase down by the end of the HRH Program, after providing the catalyst to build a sustainable health education system. At this point, the Government of Rwanda will need to absorb the ongoing costs of maintaining this system.

The primary cost associated with meeting the goals of the HRH program will be the increase in salaries for the doctors, nurses, dentists and health managers who will have been produced. By the end of the 2018 Academic Year, the HRH Program will have reached the following health workforce targets: 148 new GPs, 401 new specialists, 103 Master's level nurses, 907 new A0 nurses, 4298 A1 nurses, 316 new oral health professionals, and 150 new health managers (including both MHA and CIHM graduates). This represents the pool of well-trained professionals from which the public health sector will be able to hire.

The ongoing salary commitment of the Government of Rwanda assumes that all graduates of all the programs will be employed in the public health sector. In reality this may well not be the case however making this assumption allows us to understand the maximum salary commitment which the Government of Rwanda would need to cover to employ all the graduates of the programs.

Table 37. Additional annual salary commitment for the Government of Rwanda by 2018

Position Type	Additional Number Employed	Position Gross Annual Salary	Position Gross Annual Salary w/ increase	Total Salary Commitment
GPs	148	$12,317	$14,781	$2,187,581
Specialists	401	$21,563	$25,876	$10,376,352
Nurses - Masters	103	$11,111	$13,333	$1,373,333
Nurses – A0	907	$8,926	$10,711	$9,715,162
Nurses – A1	4,298	$6,492	$7,791	$33,485,104
Nurses – A2	-3,100	$3,619	$4,343	($13,462,857)
Dental Assistants	155	$6,492	$7,791	$1,207,583
Dental Therapists	161	$12,317	$14,781	$2,379,733
TOTAL				**$47,261,992**

Student tuition fees for physicians, nurses, dentists and health managers are generally paid for by the Government of Rwanda which then imposes a service requirement in the public health system on graduates. Table 38 details the annual costs which the Government of Rwanda will need to cover based on the numbers of students in each program.

Table 38. Annual Tuition Fee Costs to be Covered by the Government of Rwanda, by year

	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Physician undergraduate	$2,023,000	$2,040,500	$1,904,000	$1,921,500	$1,900,500	$1,883,000	$1,883,000
Number of students	*578*	*583*	*544*	*549*	*543*	*538*	*538*
FNS Nursing Programs	$1,352,500	$1,737,500	$1,965,000	$2,002,500	$1,965,000	$1,790,000	$1,790,000
Number of students	*541*	*695*	*786*	*801*	*786*	*716*	*716*
Nursing Schools	$3,687,500	$5,062,500	$5,562,500	$5,687,500	$5,687,500	$5,687,500	$5,687,500
Number of students	*1,475*	*2,025*	*2,225*	*2,275*	*2,275*	*2,275*	*2,275*
Dentistry School	$215,625	$214,583	$222,917	$231,250	$237,500	$237,500	$178,125
Number of students	*25*	*97*	*92*	*92*	*92*	*92*	*92*
Health Management	$170,000	$320,000	$320,000	$320,000	$320,000	$320,000	$320,000
Number of students	*17*	*32*	*32*	*32*	*32*	*32*	*32*
TOTAL	**$7,448,625**	**$9,375,083**	**$9,974,417**	**$10,162,750**	**$10,110,500**	**$9,918,000**	**$9,858,625**

In addition to these costs, the Government of Rwanda will need to maintain purchased equipment and replace equipment as it reaches the end of its useful life and keep infrastructure updated. During the course of the program, these costs will be met through the proposal funding. After that time, if we assume ten year equipment cycles and an internationally recognized cost of maintenance of 10% of the value of the equipment, the Government of Rwanda will need to meet a commitment of $13 million in replacement costs, spread over several years, as well as $1.5 million per year in maintenance.

The budget allocated to the health sector by the Government of Rwanda for the fiscal year 2010/2011 was $167 million out of a total government budget of $1.64 billion dollars. This represents an allocation of 10.20% of the government budget to health.

President Kagame has committed Rwanda to meet the Abuja target for allocation of government budget to health to 15% in a short timeframe.[7] The recently announced 2011/2012 budget indicated that spending allocated to the health sector would increase by 31% year on year (2010/2011 to 2011/2012). This demonstrates Rwanda's genuine commitment to improving the health of its population.

On a conservative projection of a 5% annual increase in the Government of Rwanda budget and an increase by the time of the 2013/2014 budget to 15% of the government budget going to the health sector, by 2018 the annual health sector operational budget will have increased by $172 million to an annual total budget of $339 million, making the necessary additional salary commitment of $43 million and annual tuition fee commitment of $9 million well affordable.

[7] "We pledge to set a target of allocating at least 15% of our annual budget to the improvement of the health sector." Abuja Declaration on HIV/AIDS, TB and Other Related Infectious Diseases, Abuja, Nigeria, April 2001.

Planning Phase and Systems Strengthening Activities

Appendix 3

Appendix 3. Planning Phase and Systems Strengthening Activities

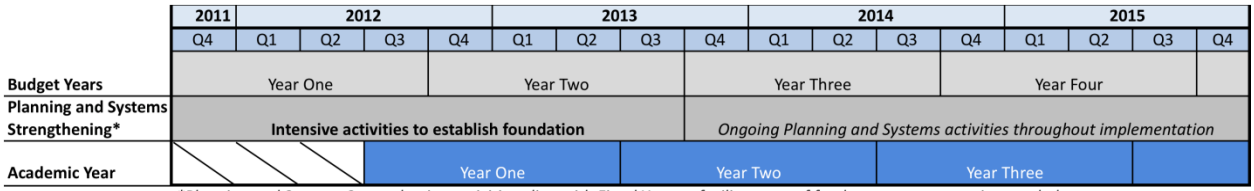
I. Objective

Activities related to planning and systems strengthening are critical to the success of the HRH Program. These activities will be intensive in the first year of the program, requiring additional support from the US Academic Consortium. Over time, these activities will be mainstreamed within the program and financial management structures that have been strengthened to effectively manage the HRH Program. In this way, health education in Rwanda will be dramatically improved through long-term systems-level investment.

II. Timeframe

The Government of Rwanda hopes that funds will be awarded for the HRH Program by October 1, 2011. In this case, Year One of Planning and Systems Strengthening activities will run from October 1, 2011 – September 30, 2012. Year Two will run from October 2012 – September 30, 2013. Year One will involve the heavy up-front planning necessary to launch an initiative of this scale and scope. During Year Two, the Planning Phase will continue at 50% of the efforts of Year One. The total planning period will last 2 years and taper into ongoing program management activities that are part of implementation of the HRH Program. See Figure 6 for how the planning phase will overlap with the start of the Implementation Phase, which is the start of the Academic Year in July 2012. The budget years are also provided for reference.

Figure 6. Timeline for the Planning Phase



**Planning and Systems Strengthening activities align with Fiscal Year, to facilitate use of funds as soon as grant is awarded.*

A. Activities in the Planning Phase

The activities related to the Planning Phase will fall into three broad categories: 1) program management; 2) health cadre program development; and 3) financial management.

1. Program Management

During Year One of the Planning Phase, the framework for program management of the HRH Program will be established. This organizing structure is principally comprised of the HRH Steering Committee, the HRH Program support staff within the Ministry of Health's Medical Education and Research Unit and RUMHS, and the Health Cadre Sub-Groups. Intensive work will also include planning for the first academic year and first cohort of US faculty, development of the monitoring and evaluation procedures, and validating the plans for the infrastructure and equipment upgrades at the schools and teaching hospitals.

The HRH program support staff will be responsible for closely coordinating the Ministry of Health and the US Academic Consortium members. This will include recruitment, orientation, and close partnership with Health Cadre Sub-Groups on the strategy for US faculty deployment.

Effective monitoring and evaluation will be critical to ensure the HRH Program is on track to meet its ambitious goals. M&E will be a shared responsibility between the M&E Officer at the Medical Education and Research Unit and the M&E staff within the SPIU. In addition, a full-time M&E specialist from the US Academic Consortium will work with the Ministry of Health beginning in the first academic year (July 2012). The US faculty member will focus on capacity building within the Ministry of Health and SPIU in addition to trainings of sub-recipients.

Milestones

- Hiring and train the HRH Program Support Staff (see Appendix 12 for detailed roles and responsibilities)
- Convene the HRH Steering Committee and establish ongoing meetings
- Convene the Health Cadre Sub-Groups and establish ongoing meetings
- Create a detailed plan for implementing the M&E strategy and process for collecting indicators
- Train sub-recipients in M&E program requirements
- Assist US Schools with developing recruitment strategy for US Faculty, including recruitment material and orientation plan
- Host orientation for the US Academic Consortium
- Launch first Academic Year of the HRH Program and deployment of US faculty

2. Health Cadre Program Development

Many of the education programs addressed through the HRH Program are either entirely new or require re-evaluation of curricula and teaching strategy. During the Planning Phase, there will be a range of activities that will be coordinated through the Health Cadre Sub-Groups. An overview of key areas of work for each cadre is provided below:

a. Physicians Sub-Group

New postgraduate programs for some specialty areas will be introduced through the HRH Program, such as Emergency Medicine. In other cases, new components of existing programs are required, such as the subspecialty training modules in surgery and internal medicine. Rwandan leadership in these post graduate programs will work with US faculty to develop or revise curricula and plan clinical rotations.

The rapid scale-up of the postgraduate programs requires active recruitment of students. The planning phase of the HRH Project will provide time for identification and outreach to top undergraduate and general practitioner candidates for specialization.

During the planning phase, recruitment materials for US faculty will be finalized. As faculty will be deployed in July of 2012, this will require that recruitment efforts start as early as possible. To properly receive the faculty who will be dedicating their time to the Rwanda HRH Program and to help them to use their time here as productively as possible, an orientation session will take place. Orientation materials will be prepared to

give new US recruits as much information about their new home as possible, in order to ease the transition.

Groups of physicians based on specialties will be formed to consult on the curriculum and other components of their program. These will include both Rwandan leadership and US faculty leadership, from institutions that will be sending faculty in that specialty. The sub-groups will provide guidance on program development, coordinating both in person and through phone calls on a regular basis. These groups began collaboration at the May, 2011 meeting hosted by the Ministry of Health, and will continue throughout the Planning Phase.

Through the HRH Program, clinical training will be strengthened by investment in infrastructure and equipment upgrades at teaching facilities and schools. While an initial equipment and infrastructure assessment was conducted at each site for the purposes of this funding proposal, these sites will need to be assessed for each specialty rotation area individually, by specialists who have understanding of the equipment and infrastructure needed to run a high quality postgraduate residency program. These experts will conduct this assessment early in the planning phase to inform procurement and contracting of proper equipment and infrastructure.

Finally, while an approach to mentoring and faculty development has been defined, individual plans are needed for each specialty. A workshop will be convened to design a long-term faculty development work-plan for physicians. Where international training is required, sites for these courses will be confirmed and partnerships established. A schedule for prioritized specialties will be created and junior faculty eligible for this training will be immediately identified. Where in-country training is sufficient, specific faculty development activities and teaching methods (grand rounds, seminars, etc.) need to be defined.

Each of these critical areas of work related to program development, curricula, mentoring, infrastructure and equipment, M&E, and faculty development will be an intensive focus of the first two years of the program, and will continue to be a significant component of the HRH Program throughout its implementation.

i. Personnel and Coordination

During Year 1 of the Planning Phase, 9.5 FTEs from the US Academic Consortium will focus on recruitment, orientation, program and curricula development, and infrastructure and equipment specifications. The amount of support staff needed from the US Academic Consortium was determined based on the following estimations. It is expected, however, that schools will share responsibilities across these bodies of work such that one FTE may be shared between institutions.

- Residency Program Development (6)
    - Including mentoring strategy and faculty deployment plan
- Recruitment and Orientation for US Academic Staff (.75)
- Infrastructure and Equipment Strategy (.75)
- Faculty Development Strategy (1)
- Monitoring and Evaluation (1)

During Year 2, the engagement from the US Academic Consortium on Planning and Systems Strengthening activities will decrease to 4.75 FTEs. Though these areas of work will continue throughout implementation, US faculty support will be tapered down and be integrated within the responsibilities of Rwandan officials working on the program and of members of the US Academic Consortium who work as full-time mentors with specific specialty programs. These full-time faculty mentors will be on the ground beginning in July 2012 for the first Academic Year of the program. As they work, they will add capacity to program development activities that were the focus of the intensive pre-academic year planning work. The Physician Sub-Group will serve as the coordinating mechanism for US Academic Consortium faculty to continue to collaborate on activities related to the Planning Phase.

b. Nursing and Midwifery Sub-Group

The Nursing and Midwifery program includes a number of new initiatives that will contribute to the goal of increasing the skill levels of nurses and midwives in Rwanda. In addition, due to the rapid evolution of the Nursing and Midwifery program in the last few years, national-level capacity requires strengthening to ensure that Rwanda is able to produce the number of skilled nurses and midwives necessary to meet the population's needs.

i. Personnel and Coordination

Members of the US Academic Consortium will provide support on national systems-level program management and program development initiatives to advance the goals of nursing and midwifery. Full-time staff will be recruited to support the following areas of work:

- National-level support to Faculty of Nursing Sciences (1)
- Skills-lab development and expansion (1)
- E-learning Curricula and Program Design (1)
- Curricula Development for new programs and review for existing programs (1)
- Build capacity of Nursing and Midwifery Council in regulatory procedures (1)

These five people will be deployed to Rwanda as soon as program funds are awarded. Full-time support for each of these positions will be continued for three years. After 3 years, the FTE devoted to skills-lab work will phase out; the partner to the Nursing and Midwifery Council will phase out after 4 years; the e-learning expert will leave after 5 years; and the curricula support person will phase out after 6 years. The support to FNS will be maintained throughout the HRH Program. The length of stay for each of these positions was determined based on feasibility of fully transitioning capacity and expertise.

In addition, members of the US Academic Consortium will be closely engaged with Rwandan leadership on monitoring and evaluation, recruitment of nurses and midwives from the US Academic Consortium, and collaborating with the SPIU and

teaching hospitals on the necessary infrastructure and equipment upgrades to ensure training sites will provide high quality education. This support, shared between participating institutions, will amount to approximately the following FTEs:

- Monitoring and Evaluation (.25)
- Recruitment and Orientation for US faculty (.7)
- Infrastructure and Equipment upgrades (.1)

c. Health Management Sub-Group

The School of Public Health, in partnership with Yale University, has already done much of the groundwork for the Masters in Health Administration and the Certificate in International Health Management Programs. In addition, infrastructure and equipment investments are centered at the SPH and are mostly educational, avoiding some of the complications of costly medical equipment and complicated clinical rotation schedules.

What will require significant preparation, however, is the schedule for recruitment and enrollment of students and the deployment of faculty. The students in the CIHM program are working professionals. They will need to take leave of their jobs to complete the CIHM, and will therefore require significant advance notice. Recruitment for this program must thus begin well in advance of its start date. US faculty will serve largely as mentors in the health facilities, working one-on-one with managers. These mentoring relationships must be carefully coordinated to ensure optimal use of limited US faculty. Facilities will be identified as mentoring sites and prioritized for US faculty presence.

i. Personnel and Coordination

There will be one FTE from Yale to work with the SPH to complete this work. The areas of focus will largely be:

- Recruitment strategy for health management students;
- Long-term faculty and mentor development strategy;
- Post-graduate support for students of health management programs.

d. Oral Health Sub-Group

The ambitious dental program proposed in the HRH Program is a completely new program that will need to be built from the ground up. The new curriculum must be developed from scratch, the several new cadres of health workers will require further clarification of roles, and a long term plan for programmatic sustainability is needed as there are currently no Rwandan faculty members in the School of Dentistry.

i. Personnel and Coordination

The Dean of the School of Dentistry will spearhead the development of the program in conjunction with leadership from US Academic Partnership Institutions. Elaboration of the curriculum will require a curriculum specialist with experience in oral health. There will be one (1) FTE, focusing primarily on the following areas:

- Curricula development;
- Student recruitment strategy;
- Faculty development strategy.

3. Financial Management

The SPIU at the Ministry of Health has a demonstrated record of strong financial management in successful health sector development initiatives. Despite this, the launch of this large-scale program will require recruitment of staff, and the establishment of procedures specific to management of the initiative. In addition, the SPIU will need to adjust to management of funds disbursed by the USG, which will follow new procedures and regulations.

The SPIU will be engaged in intensive planning and systems establishment from October 2011 until the first academic year of the HRH Program, beginning in July 2012. The following list, which is not exhaustive, outlines the major milestones for the SPIU in Year One. Reaching each of these milestones will ensure smooth program implementation in the following years.

Milestones

- Hiring of 5 full-time staff to manage the HRH Program;
- Memoranda of Understanding and contracts signed between SPIU and sub-recipients.
- Infrastructure and equipment assessments conducted.
- Costed and tendered equipment and infrastructure.
- Secured housing for US faculty.
- Conduct orientation meeting for project sub-recipients.
- Conduct training of sub-recipients on financial, M&E and procurement.
- Ensure that all Memoranda of Understanding and contracts and other sub-recipient agreements are fully executed.

a. Personnel and Coordination

Representatives from each health cadre will be engaged with SPIU on development of specifications for infrastructure and equipment. However, there will be no full-time staff from the US Academic Consortium dedicated to supporting the SPIU.

Clinical Training Sites

Appendix 4

Appendix 4. Clinical Training Site

Upgrading hospitals to become learning environments is an integral part of the HRH Program. Substantial improvements will be made through investment in human resources training, infrastructure and equipment. These investments will provide the institutional foundation for high-quality care and education in Rwanda into the future.

I. Importance of clinical training sites to health sciences education

The current curricula for students is heavily focused on classroom-based learning, due to both capacity and quality constraints at teaching hospitals, as well as to a lack of adequate planning, implementation, and supervision of on-site instruction. However, it is widely recognized across fields that hands-on methods of learning help trainees apply and retain didactic lessons, and makes them better equipped once they are deployed in their respective fields.

In the HRH Program, each health cadre uses training sites as a cornerstone of its curricula. Each cadre and specialty has a unique curriculum. However, clinical training sites will also provide integrated training opportunities. Clinical training sites will support the training of undergraduate and post-graduate students. Whenever possible, physicians, nurses, and other health professionals will be trained in the same teaching health facilities, to foster team-based learning. A further advantage of integrating training across medical specialties and types of healthcare providers is to encourage interdisciplinary and inter-professional collaboration. Recent developments in medical education emphasize the importance of breaking down specialty and professional silos while enhancing collaborative and non-hierarchical relationships.

Deployment to clinical training sites will be coordinated across cadres both to increase interdisciplinary team-based learning on site and to equitably divide mentors and postgraduates across health facilities that will benefit from their presence on site. The HRH Program will provide a mechanism for this coordination.

For physicians and nurse/midwives, most of the learning for clinical trainees will occur at the bedside, through clinical mentoring and supervision by experienced clinicians. US faculty will work with students at clinical training sites, as well as provide peer-to-peer mentoring among practicing clinicians in how to teach effectively in a clinical setting.

The planned new curriculum for Oral Health Sciences includes a rotation for all students in community health. For students pursuing a degree in dental therapy, they will spend their 3rd year at clinical training sites. Similarly, students of health management will apply their skills at health facilities throughout their education. This type of supervised exposure to patients and the health facility environment helps to translate the lessons learned in the classroom into optimal clinical practice, management, and professional behavior.

II. Locations of clinical training sites

Currently, the clinical training sites are insufficient, in terms of both quality and quantity, to accommodate even the current number of students they are assigned, much less the increased cohorts that will be enrolled through the HRH Program. Teaching hospitals thus pose a serious limiting factor for the scale-up of the health workforce in Rwanda. Based on the number of students in each program, the

clinical rotations they must complete at each type of facility, and the capacity of those facilities (in terms of size) to absorb each type of student, a minimum number of clinical training sites was established. This includes 4 referral hospitals, 5 provincial hospitals, and 5 district hospitals. All of these facilities require upgrades to serve as quality teaching hospitals.

There are currently three referral hospitals in Rwanda which already serve as teaching hospitals for residents, postgraduates, nursing and midwifery students:

- Centre Hospitalier Universitaire de Kigali (CHUK)
- King Faisal Hospital (KFH)
- Centre Hospitalier Universitaire de Butare (CHUB)

Kanombe Military Hospital (KMH) is in the process of adding the infrastructure, equipment and human resource needs to upgrade from a district hospital to a referral hospital by the end of 2011. Given these plans, the Ministry of Health anticipates that there will be 4 referral hospitals that will serve as clinical training sites when the new Academic Year begins around July 2012. Nursing and midwifery students also complete rotations at district hospitals throughout the country, in largely unsupervised, low-quality facilities.

The Ministry of Health plans to upgrade 5 District Hospitals to the status of Provincial Hospitals. The upgrade is planned before implementation of the HRH Program; therefore this proposal refers to the following hospitals as “Provincial”:

- Kibagabaga (Kigali Province)
- Ruhengeri (Northern Province)
- Kabgayi (Western Province)
- Gihundwe (Southern Province)
- Rwamagana (Eastern Province)

The Provincial Hospitals in Ruhengeri, Rwamagana, and Kabgayi are affiliated with nursing schools. There are also clinical training sites for nursing and midwifery students at Byumba and Kibungo district hospitals, which are closely affiliated with nursing schools. While Byumba and Kibungo will not be upgraded to Provincial Hospitals, the Ministry of Health will also provide some modest upgrades at these district hospitals to enhance the learning opportunity for nursing and midwifery students.

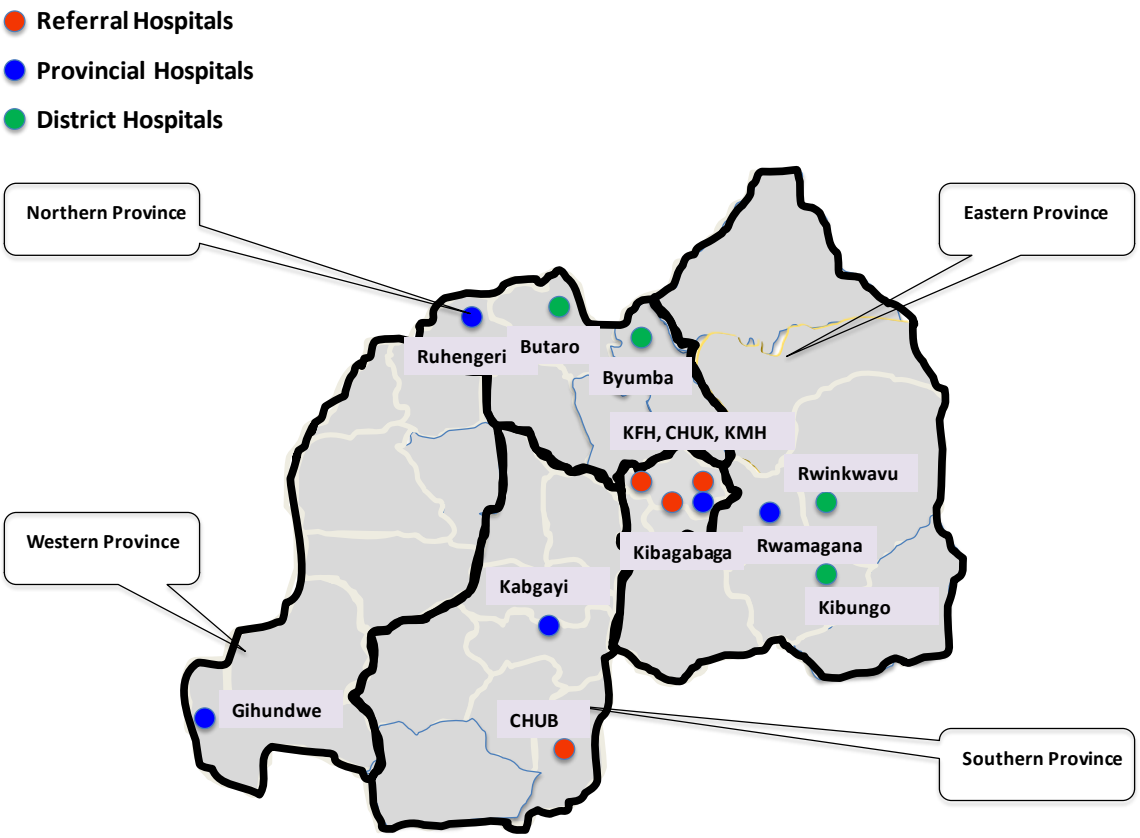
The HRH Program will also add Butaro and Rwinkwavu District Hospitals as clinical training sites for postgraduates, nursing and midwifery. These sites are government facilities but also receive financial and human resource support from the international NGO, Partners in Health (PIH). Butaro and Rwinkwavu already have the infrastructure and equipment necessary to become clinical training sites. As a result, they will not receive infrastructure and equipment upgrades from the HRH Program except for construction of a dormitory to accommodate students. See Table 39 for the summary of the referral, provincial and district hospitals that will be clinical training sites for medical, nursing, dentistry and midwifery students in the HRH Program, and

Figure **7** for the geographic location of these sites.

Table 39. Level and Name of Clinical Training Sites

Level	Name				
Referral Hospital	CHUK	KFH	CHUB	KMH	
Provincial Hospital	Kibagabaga	Ruhengeri	Rwamagana	Kabgayi	Gihundwe
District Hospital	Butaro	Rwinkwavu	Byumba	Kibungo	

Figure 7. Map of clinical training sites for HRH Program



The School of Dentistry will need to expand their clinical training sites to meet the targets set in the HRH Program. School of Dentistry students will conduct training at six sites, including one Referral Hospital, four Provincial Hospitals, and one District Hospital. Through the HRH Program, students at the School of Public Health will spend 75% of the time in their work setting for on-the-job mentorship. The locations will be their places of employment, which will likely be spread out across Rwanda.

A. Upgrading infrastructure and equipment to enable high quality education

To create an environment in which world-class health professionals can be trained, significant infrastructure and equipment upgrades are necessary. Plans for upgrades were devised with Director Generals of Hospitals, in partnership with the Ministry of Health and members of the US

Academic Consortium. A second round of more detailed assessments will be conducted during the planning phase by the SPIU, in partnership with hospitals, schools, and US faculty.

At health facilities, adequate infrastructure for clinical training includes sufficient space for patient care and training, accommodation for trainees and faculty, and reliable access to educational and training materials. Complete lists of upgrade construction, equipment, and supplies can be found in Appendix 1. Medical equipment will need to be purchased, or in some cases repaired. Along with purchasing of medical equipment, standard contracts for service and maintenance of equipment will be arranged by the Single Project Implementation Unit to prevent the frequent challenge presented by malfunctioning or nonfunctional equipment at hospitals. Schools also require upgrades to accommodate the number of students targeted for enrollment, and to guarantee that education is of highest quality. Upgrades to schools will include classrooms, simulation labs, student accommodation, laboratories, and libraries.

Physician Specialties

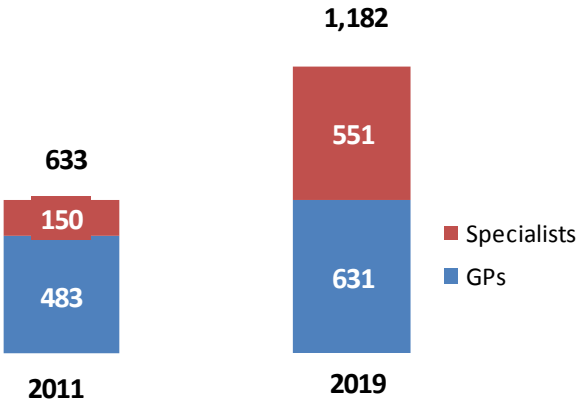
Appendix 5

Appendix 5. Physician Specialties

This Appendix details the scale-up plan for each physician specialty currently included within the HRH Program. It focuses on the targets specific to each specialty, as well as the curriculum and clinical rotations and faculty targets, including US partners, to achieve the targets. As additional specialties are identified for scale-up, a detailed plan will be developed for implementation in those areas as well.

Rwanda has a critical shortage of health workers, notably physicians. The existing physician cadre is dominated by general practitioners (GPs), who receive limited clinical training before being licensed and deployed. In particular, specialists with additional clinical training are in extremely short supply, and more of these highly skilled practitioners are urgently needed to care for patients and train the healthcare workforce. From 2012 to 2019, the HRH Program will increase the total number of physicians, from 633 to 1,182, while substantially shifting the skill mix of the cadre by increasing the number of specialists and subspecialists from 150 to 551. The level of training of general practitioners will also be improved.

Figure 8. Physician Workforce Targets in HRH Program, 2012-2019



The targets for both overall physician workforce increases and increases by specialty were calculated based on a number of criteria and assumptions, including:

1) Number of postgraduates that could rotate at any given time at the 4 Referral Hospitals, 5 Provincial Hospitals and 2 District Hospitals that will be used for the program. The constraints considered include: estimated physical space for each specialty, rough patient case load and type of cases.

2) Maximum number of postgraduate students that could be enrolled based on hospital capacities.

3) Allocation of postgraduates by specialty proportionately across the referral, provincial, and district hospitals.

4) Presence of at least one US faculty member at each hospital where postgraduates would rotate during academic years 2012-2014.

5) Number of faculty commitments per specialty from US schools.

6) Strategies outlined in the concept notes that Rwandan faculty and their US counterparts created at the Academic Consortium meeting, including the individual constraints of each specialty area such as the benefits and disadvantages of centralization vs. decentralization of teaching facilities.

7) An overall attrition rate of 10% from the time of enrollment into postgraduate program, to the time of graduation.

Based on the above considerations, an ambitious but achievable target for the physician workforce is an increase of 401 specialists and subspecialists (from 150 to 551 by the end of the 2018 academic year). The HRH Program focuses on dramatically increasing the output of physicians in the core specialties of internal medicine, pediatrics, obstetrics and gynecology, surgery and anesthesia, and family and community medicine. An additional priority specialty, emergency medicine, is also addressed. Detailed plans have been elaborated for each specialty to address staffing and equipment needs, student enrollment targets, curriculum and clinical rotation, and faculty requirements. These plans are summarized, by specialty, in the following sections.

I. Internal Medicine

A. Current situation

Internal medicine specialists in Rwanda serve as primary providers of hospital-based care at the teaching hospitals CHUK, CHUB, and King Faisal as well as some provincial and district hospitals. Demand for internal medicine specialty physicians greatly outstrips the available supply: there are only 12 Rwandan general internists, expected to increase to 15 by the end of the 2011 academic year. Through the HRH Program, the number of certified internal medicine specialists will increase to 65, and internists will be placed at provincial hospitals and with increasing capacity in district hospitals to provide a first-level consultation service for patients with complex medical conditions. This will reduce the demand for services on the referral hospital and increase the availability of internists at these sites both for teaching and for the development of subspecialty medical services. Outpatient internal medicine clinics are hospital-based and serve primarily as sites for follow-up for hospitalizations.

Postgraduate residents rotate for one year in each of the three teaching hospitals (King Faisal, CHUK, and CHUB). The 4th year of training is flexible, allowing for elective experiences in subspecialty areas of their choice at hospitals both within and outside of Rwanda. To date, the uptake of internal medicine residency training has been limited, with only 3 residents eligible to sit for final exams in 2011. Lack of access to high quality training environments and lack of clear professional incentives for specialization contributes to the low level of uptake to internal medicine training. The capacity for expanded postgraduate training at the teaching hospitals is currently limited based on availability of faculty and the poor status of infrastructure and equipment at hospitals.

B. Needs and Gaps

1. Workforce Targets

Several important gaps have been identified that need to be addressed in order to support enhanced postgraduate education in internal medicine to produce sufficient practicing internists. These include:

- Inadequate numbers of general internists to provide bedside teaching in the curriculum;
- Lack of opportunity to develop skill in procedures essential for care of patients seen by internists including bone marrow biopsy, pleural and abdominal tap, joint aspiration, etc;
- Lack of subspecialty services with opportunities for exposure to and, when appropriate, training in specialty medical treatment and medical procedures including chemotherapy, endoscopy/colonoscopy, bronchoscopy, dialysis, echocardiography, and cardiac catheterization;
- Access to adequate and comprehensive clinical care services at primary training sites with specific gaps noted in radiology and availability of laboratory tests including histopathology.

Based on the targets set for the number of Internal Medicine postgraduate enrollment, as well as the increased capacity from the US Academic Consortium and their partnership with Rwandan faculty, the HRH Program will produce 65 additional internal medicine physicians for Rwanda's health workforce by the program's completion in 2019.

Table 40. Internal Medicine Workforce Targets, 2012-2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
Internal Medicine	12	15	22	22	29	38	52	66	80	65

2. Infrastructure and Equipment

The current infrastructure and equipment in teaching hospitals and the Faculty of Medicine does not permit an optimal learning environment. Opportunities for active and self-learning and exchange are particularly sparse, including:

- Information and technology infrastructure to support active learning as part of clinical care;
- Medical library containing core textbooks as well as access to web-based resources;
- Sufficient meeting and study space at schools and teaching hospitals.

Furthermore, while diagnostic equipment is available in some sites, in many cases the equipment is old and no longer adequate for high quality assessments, and the lack of biomedical engineering support makes maintenance of the equipment challenging. Not only does the lack of diagnostic equipment compromise patient care, but it also stifles opportunity to educate postgraduates in how to properly use these tools. Preliminary assessment of the availability of key diagnostic testing is summarized in Table 41.

Table 41. Diagnostic testing modalities by hospital

Modality	CHUK	CHUB	KF
X-ray	Present	Non-functional	Present
Ultrasound (Radiology)	Present	Present	Present
Ultrasound (Portable)	Absent	Absent	Absent
Mammography	Present	Absent	Present
CT	Present	Planned	Present
MRI	Absent	Absent	Present
Endoscopy	Present	Present (IM)	Present
Bronchoscopy	Absent	Present (IM)	Present
Fluoroscopy	Absent	Nonfunctional	Absent
Spirometry	Absent	Present	Unknown
Cardiac Stress Testing	Absent	Absent	Absent
Portable EKG	Absent	Absent	Absent
Clinical Laboratory Testing (1)	Varies by test	Varies by test	Varies by test
Cardiac Echo	Unknown	Unknown	Unknown
Acute Dialysis	Absent	Present	Present
Cardiac Catheter	Absent	Absent	Absent
Microbiology Lab (2)	Present	Present	Present

(1)Including such tests as electrolytes, renal function, hepatic function, specific serologies, etc.

(2)Blood culture, AFB smear, etc.

Subspecialty services are limited in many hospitals, meaning that students lack educational opportunities in these areas. Current availability of key inpatient subspecialty consultation services for clinical care based on working group discussions is outlined in Table 42.

Table 42. Availability of subspecialty services by hospital (May 2011)

Subspecialty	CHUK	CHUB	King Faisal
Cardiology	X		X
Pulmonary		X	X
Nephrology	X	X	X
Gastroenterology	X		
Oncology			

3. Student Targets

The internal medicine program aims to enroll 16 first-year postgraduates per year. In addition, a selected number of postgraduates or junior faculty will be selected for additional subspecialty training abroad. First-year enrollment is detailed below.

Table 43. First-year Enrollment Targets for Internal Medicine 2012 - 2018

Program	2011-2012	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Internal Medicine	10	16	16	16	16	16	16	16

C. Curriculum and Clinical Rotations

The current curriculum for internal medicine education in Rwanda, both at the undergraduate and postgraduate level, is modular, based around the key subspecialties. This curriculum emphasizes didactic learning sessions not linked to clinical care in the hospital. Though procedural competencies have been outlined for each module, the lack of integration between curricular modules and clinical care makes realization of these competencies challenging. A new internal medicine curriculum will be developed to synch with clinical rotations and provide a more effective, hands-on learning experience.

1. Curriculum

The revised Internal Medicine curriculum will maintain the key knowledge objectives outlined in the Ministry of Health curriculum developed in 2007. The emphasis in the revised curriculum, however, will be on teaching through clinical care. Clinical services in teaching hospitals will be redesigned in a manner to support achievement of both knowledge and clinical-skill based competencies for the key subspecialty areas.

Bedside teaching will be supplemented by didactic content, which will be synchronized across training sites. The content for these teaching sessions will establish a key foundation of knowledge for all participants. The emphasis will be on resident-driven, case-based presentations with correlation to clinical cases seen on the wards. Correlation with bedside examination will be incorporated wherever possible.

Curricula will be defined for each subspecialty area. In addition, a strengthened undergraduate curriculum at the Faculty of Medicine will include critical content areas such as professionalism, medical ethics, communication skills, palliative and end-of-life care, health systems and management, medical informatics, medical logic and decision-making, and quality improvement which are not currently adequately provided.

Current knowledge-based objectives and clinical competencies for internal medicine training will be reviewed as part of the initial phase of the curriculum redesign. At the undergraduate level, students will be expected to meet knowledge objectives and be exposed to key procedures within internal medicine. At the postgraduate level, advanced knowledge objectives will be defined and key procedural competencies will be defined.

For postgraduate residents, existing competencies will be reviewed to establish a core subset of competencies for which proficiency is mandatory to complete residency training. Training in these competencies will be the focus of the first three years of postgraduate training. In the fourth year, postgraduate residents will focus on areas of subspecialty emphasis with opportunities for developing competency in subspecialty procedures and improved capacity for management of complex cases.

2. Clinical Rotations

In years 1-4 of the program, training in subspecialty areas will be integrated into general medicine ward services. As capacity increases and subspecialty services develop, specific rotations will be created for postgraduate residents in these areas. As shown in Table 44, Phase I subspecialty services represent those services with procedural or advanced medical treatment protocols for which input from subspecialists will be required in the initial curriculum design. These services will be early targets for training abroad to develop subspecialty service and teaching capacity. Phase 2 subspecialty services are services for which training will be initially integrated into the general medicine ward services. The development of subspecialty services in these areas may occur later based on provider availability and clinical care needs. Foreign faculty will be recruited to support the subspecialties below according to their prioritization into the two phases below.

Table 44. Prioritization of subspecialties

Phase 1	Phase 2
Cardiology	Infectious Diseases/Immunology
Pulmonary	Rheumatology
Nephrology	Endocrinology
Gastroenterology	Emergency Medicine
Hematology/Oncology	Critical Care
	Psychiatry

Outpatient teaching as part of training needs to be developed. The current model provides no outpatient experience in the first 2 years of training and then places residents in a position of practicing with significant autonomy in years 3 and 4. A model will need to be developed for increasing residents' role in outpatient consultations with direct supervision by faculty. As this model does not currently exist in Rwanda, it is anticipated that to make this training operational, it may require significant evaluation and dynamic reevaluation of teaching strategies over the first 1-2 years of the program. A preceptor model similar to that used in US training institutions may be appropriate.

Internal medicine postgraduates will be trained at an increasing number of sites as teaching hospitals are upgraded. The number of teaching sites will increase from the current 3 referral hospitals to a total of 10 hospitals across the country by 2015. Sites are eligible for clinical training based on the availability of clinical mentors, as well as the necessary infrastructure and equipment to support high-quality training. Table 45 shows the clinical training sites for Internal Medicine postgraduate training.

Table 45. Internal medicine clinical training sites, 2012-2019

2012	2013	2014	2015	2016	2017	2018
5	7	9	10	10	10	10

D. Faculty Requirements and US Academic Consortium Involvement

Teaching faculty in internal medicine will manage in-patient general medicine and specialty medicine teams including oversight of care provided by postgraduate residents and interns, daily review of all new admissions, oversight of teaching rounds post intake and at an overall frequency of at least 2x weekly, review of difficult cases with supervising residents outside of the context of ward rounds on non-rounding days, and maintaining availability to postgraduate residents and/or interns to address complex urgent issues that arise outside of rounds. Strategies for structured teaching including morning review of admissions, targeted teaching rounds for identified cases of broader interest, and case presentations in larger forums such as medical ground rounds will be considered for their effectiveness as technical approaches to education in internal medicine.

US faculty will mentor Rwandan faculty in these teaching methods, directly mentor postgraduates, and fill in gaps where the critical shortage of internists hamper medical education and quality care. The first faculty from the US Academic Consortium will arrive in July 2012, for the first academic year of the program. Involvement of US faculty will remain constant at 11 FTEs through year three, and phase down over the course of the grant, consistent with the overall objectives for the collaboration. In the academic year 2019 – 2020, there will be no internal medicine faculty from the US Academic Consortium.

Table 46. Internal medicine US faculty, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Internal Medicine	11	11	11	9	7	5	2

In the planning phase prior to the first cohort of mentors, there will be significant work related to detailed infrastructure and equipment needs assessments, program planning and curriculum development. As soon as program funds are awarded, one FTE (in addition to those outlined above) will be devoted to planning and systems strengthening activities related to internal medicine. This support will decrease to .5 FTEs in the second year of the HRH Program.

US faculty will be paired with Rwandan junior faculty in the provision of clinical care and clinical teaching services. This mentorship relationship will ensure that Rwandan physicians are engaged early in a teaching role in the new curriculum and receive direct support in order to facilitate their taking a leadership role in their medical institutions. The relationships will involve bilateral exchange between Rwandan and US faculty who each bring critical and complementary skills to the process of developing internal medicine education in Rwanda.

II. Obstetrics/Gynecology

A. Current situation

By the end of the 2011 academic year, there will be 21 Rwandan Obstetricians and Gynecologists in Rwanda, an insufficient number to provide a full range of high-quality services to the population. Furthermore, these providers are largely centered in Kigali, rather than in the districts where they are desperately needed. This pattern is mirrored in obstetrics/gynecology medical education. All obstetrics/gynecology academic teaching faculty members are located at CHUK and CHUB in addition to the majority of clinical teaching staff. Out of 9 current academic faculty members, 3 are expatriates and 6 are Rwandan. This number of obstetrics/gynecology teaching faculty is inadequate to provide quality academic instruction and clinical training for the current number of undergraduates and postgraduates.

Due to the shortage of teaching faculty, residents are frequently obliged to travel to Kigali to receive lectures at CHUK. Students must pay for this travel, room and board on their own. Most of the clinical teaching faculty members do not have an appointment at the Faculty of Medicine, including the clinical head of the department at CHUK who is responsible for the clinical training of all undergrad and postgraduate students/trainees. Career ladders within the department do not exist and financial compensation is not based on experience or teaching excellence. There is no "protected time" for faculty to engage in teaching or evaluation responsibilities. These factors lead to a poor quality of education, resulting in difficulty recruiting candidates and suboptimal skill level of obstetricians/gynecologists educated through the program.

B. Needs and Gaps

1. Workforce Targets

More obstetricians/gynecologists are needed both to care for the population and to teach. Through the HRH Program, 65 additional obstetricians/gynecologists will be trained in Rwanda (Table 47), providing a sufficiently large cadre to select exceptional individuals for teaching posts and allowing for decentralization of providers to provincial sites where care is urgently needed.

Table 47. Obstetrics/gynecologyworkforce targets, 2012-2019

	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
OB/Gyn	21	31	31	38	50	62	74	86	65

2. Infrastructure and Equipment

The three teaching referral teaching hospitals vary in their ability to train current medical students and postgraduates, which will intensify as postgraduate enrollment grows over time. The obstetrics/gynecology educational, service delivery and administrative capacities are different in each facility. Because KFH is a private institution, it is well equipped relative to the other teaching referral hospitals. However, in order to provide world-class teaching and service delivery, all facilities will need some degree of upgrade of equipment and expansion of infrastructure. To facilitate accelerated training of an increased number of obstetrics/gynecology postgraduates, the number of clinical training sites will

be increased. These sites will be operational as clinical training sites due to upgrades in infrastructure and equipment, and deployment of US and Rwandan faculty to provide on-site training.

While obstetrics/gynecology shares many infrastructure and equipment needs with other medical disciplines, obstetrics and gynecology practice and training also require a number of specialized items. In many cases, equipment critical to providing a robust range of gynecology and obstetrics services is nonexistent. Notably, equipment for hysteroscopy and urogynecology procedures, fetal monitors and ultrasounds are lacking in two of the three referral hospitals. Equipment for detection and treatment of abnormal cervical pathology – colposcopy, LEEP, cryosurgery, and laser – is missing or insufficient. Diagnostic equipment that does exist is often dated and does not support functions that facilitate teaching activities such as bipolar scopes, video cameras, or the ability to capture images for subsequent teaching.

Instructional infrastructure is insufficient at the teaching referral hospitals. Clinical classroom space is either nonexistent or insufficient. Instructors lack basic educational tools such as whiteboards, projectors, university-provided laptops, or sound amplification equipment (for teaching larger groups). Consultation rooms for discussion between trainees and faculty on client cases are not present. Additionally, the Faculty of Medicine lacks a skills lab to allow students to practice procedures such as knot tying and IUD insertion as well as simulate forceps- and vacuum-assisted deliveries.

Infrastructure for faculty and administrative needs is essentially nonexistent in the teaching referral hospitals. Dedicated department conference rooms, technology such as projectors and whiteboards, and space or technology for administrative assistants is lacking. Infrastructure to support physician undergraduates and postgraduates is essentially nonexistent in the teaching referral hospitals. These needs include dedicated computer labs, libraries with pertinent texts, overnight call rooms with showers, food facilities, and student lounges.

3. Student Targets

To reach workforce targets, a substantial increase in enrollment of postgraduates is urgently needed. The number of first-year postgraduates will start at 13 in 2011 and will increase to 16 in 2015, remaining constant through 2018. Assuming some attrition, these enrollment targets will produce a graduating class of 14 by 2018. Table 48 outlines the targets for first-year postgraduate enrollment in the obstetrics/gynecology residency program.

Table 48. Obstetrics/gynecology residency enrollment targets, 2011-2018

Program	2011-2012	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
OB/Gyn	13	13	13	13	16	16	16	16

C. Curriculum and Clinical Rotations

1. Curriculum

Physician postgraduates undergo a baseline entry exam prior to intake for their first postgraduate year. Additionally, at the end of their common courses (end of first year), they take a written exam. Formal written assessments are also given at the end of the second and fourth years of postgraduate education.

Currently, postgraduate trainees are required to observe or perform specific procedures a certain number of times and track them in a printed logbook. The logbook does not include any qualitative

criteria, only space to record how many procedures the trainee has observed or performed. Officially, the logbook constitutes a significant portion of the trainee's overall yearly examination (25%), but in practice it is inconsistently implemented. This limitation in the clinical piece of a student's ongoing overall assessment makes it difficult to identify areas where individuals are weak and need additional support or practice at an early stage in their training. No formal system exists for tracking which lectures students have and have not attended. Currently, students track their own attendance at lectures in a hand-written booklet. Furthermore, there is no administrative system in place to allow a student to make up a lecture that they miss.

In order to train world-class obstetrics/gynecology physicians, it will be necessary to considerably improve the process by which postgraduates' clinical skills are assessed and evaluated on an ongoing basis. The obstetrics/gynecology department at the Faculty of Medicine should design or adopt a system – ideally electronic – for submitting detailed, qualitative feedback on postgraduate clinical performance and logging cases. Administration should, in conjunction with their foreign mentor counterparts, review the types and number of cases/procedures that postgraduates must see or carry out in order to meet minimum requirements. Rubrics detailing expectations for each type of case and procedure should be developed in order to standardize and streamline the evaluation process.

The implementation of a strong system for ongoing assessment of postgraduates' clinical skills, in conjunction with updated and improved case logs, will allow for a more informed and precise review of trainees' progress. In the early stages of implementation of the HRH Program, faculty and foreign physician mentors should make it a priority to identify, discuss, and strategize each trainee's individual clinical strengths and weaknesses. This should be a process started early in a trainee's education and repeated at intervals which ensure critical targeted intervention and remediation throughout their training.

2. Clinical Rotations

All obstetrics/gynecology physician undergraduates and postgraduates currently complete their clinical training at one of three referral teaching hospitals in Rwanda – Centre Hospitalier Universitaire de Kigali (CHUK), Centre Hospitalier Universitaire de Butare (CHUB) and King Faisal Hospital (KFH), as shown in Table 49.

Table 49. Estimated Obstetrics/gynecology undergraduate and postgraduate volume (May 2011)

Hospital	Doc I	Doc II	Doc III	Doc IV	PGY1	PGY2	PGY3	PGY4
CHUK	0	30	17	10	3	0	4	1
CHUB	17	0	0	6	3	0	3	1
KFH	0	0	0	3	1	0	1	0
Total	17	30	17	19	7	0	8	2

*"Doc" refers to each year in the undergraduate program and "PG" refers to each postgraduate year.

Within the obstetrics/gynecology department, no formal divisions exist between the gynecology, maternity/obstetrics, and outpatient services. Consequently, there are no formal divisions between obstetrics/gynecology services within postgraduate clinical rotations. A postgraduate's rotation schedule within the department most often depends on the clinical demand on any given day. This ad hoc determination of postgraduates' schedules prevents critical continuity between clinical learning and

core aspects of the curriculum. In particular, it makes it more difficult for a trainee to assess the advancement of a pregnancy, complication or disease as it progresses over time. Because obstetrics constitutes the majority of patient volume, this triage approach to assigning postgraduates results in an unbalanced emphasis on obstetrics training and clinical practice.

The shortage of academic teaching faculty reduces the ability of the teaching hospitals to designate and dedicate faculty members to undergraduate clinical instruction as well as differentiate the clinical curriculum for medical students. In addition to there being no separate clinical education curriculum targeted to medical students, lectures in clinical rotations are dependent on what the postgraduate physicians receive. Officially, one day a week is dedicated to clinical lectures and education, but the implementation of teaching days is less frequent in practice and depends on the clinical schedules of teaching staff as well as the schedules of visiting expatriate professors. Furthermore, students are responsible for tracking their attendance at lectures as well as monitoring which lectures they have attended and which they lack.

As obstetrics/gynecology teaching and clinical staffing reach sufficient numbers over time, divisions should be created within the department. Forming distinct services within the obstetrics/gynecology department will facilitate a number of positive outcomes for postgraduate clinical education. First and foremost, creating clear divisions within the obstetrics/gynecology department will allow directors of postgraduate clinical rotations to align trainees' clinical duties to their clinical academics. This alignment between clinical learning and practicum will better allow trainees to assess the advancement of a pregnancy, complication or disease as it progresses over time.

Furthermore, the formation of service divisions within the obstetrics/gynecology department will necessitate designating senior faculty to take on administrative roles for each of the subdivisions within the department. Designating heads of subdivisions will create clear lines of responsibility for academic planning, postgraduate student rounding, and other directorial duties.

Finally, forming discrete services within the obstetrics/gynecology department will create a designated center for all specialty learning within that particular line of medicine. The heads of services will carry the responsibility of coordinating foreign lecturers who might visit to give lectures on particularly specialized areas of medicine within that service. In addition to serving as local experts, they will be ideal candidates to travel abroad – either for short conferences or longer-term training – for additional education within that specialty.

Clinical training sites will be added over time to accommodate the increased numbers of obstetrics/gynecology trainees. These training sites will be located in referral and provincial hospitals. The number of clinicians/educators will vary from site to site depending on client volume, but it is strongly recommended that the minimum be three obstetrics/gynecology physicians. A minimum of three obstetrics/gynecology physicians at any facility serving as a training site will ensure that clinical patient needs are sufficiently met before adding teaching and supervision duties to a clinician's responsibilities.

D. Faculty Requirements and US Academic Consortium Involvement

Currently, a significant number of senior teaching faculty members in obstetrics/gynecology are expatriates. It will be necessary to attract and train highly capable Rwanda nationals to take leadership roles in the instruction and education of undergraduate and postgraduate students and trainees. At the start of the HRH scale-up, foreign clinical obstetrics/gynecology mentors should be paired or "twinned" with current

Faculty of Medicine faculty so that they can significantly impact the leadership capacity of the teaching hospitals within a short period of time. Perhaps the most crucial responsibility of the foreign teacher mentors (in addition to carrying out instructional duties) will be to model and transfer instructional skills to current and future Rwandan faculty. Initially, 9 US faculty will be placed in Rwanda, including one rotating subspecialist. The number of US faculty will phase down to 2 by 2018 (Table 50).

Table 50. US faculty for obstetrics/gynecology, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Ob/Gyn	9	9	9	7	5	3	2

III. Pediatrics

A. Current situation

There is a severe shortage of pediatricians in Rwanda – a country of 10 million people in which 55.6% of the population is under the age of 20[8]. There are 14 Rwandan pediatricians providing clinical care in a public hospital and only 10 of these practice in a teaching facility. Subspecialty care is limited to 2 practicing pediatric cardiologists. All of these specialists are found in two major cities; none are located in provincial or district hospitals.

Efforts at increasing the number of practicing specialists are hindered by limitations in training opportunities, program infrastructure, and availability of teachers within the country. The pediatric residency program is a 4-year program and currently aims to train 10 residents each year. Unfortunately, these positions are often unfilled. The current number of pediatric residents is 7 in Year 1; 0 in Year 2; 8 in Year 3; and 1 in Year 4. The perceived poor quality of the residency program is a barrier to recruitment. Some residents are concerned that after graduation there is a lack of adequately compensated positions in clinical practice and opportunities for professional development are limited. In addition to challenges in attracting and retaining pediatric residents, a significant percentage of trained pediatricians are leaving clinical practice to pursue higher-paying private sector positions.

B. Needs and Gaps

1. Workforce Targets

Several challenges exist in improving the pediatrics workforce. These include insufficient numbers of pediatricians to supervise and teach trainees; insufficient subspecialists to address patient care needs and to teach trainees; a high patient volume limiting time for teaching, bedside training, or research. By the close of the 2018 academic year, the HRH Program will produce 62 high-quality pediatric physicians, increasing the pool of providers available to both care for patients and to teach.

Table 51. Pediatric Workforce Targets, 2012 – 2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
Pediatrics	14	15	24	24	30	38	51	64	77	62

2. Infrastructure and Equipment

Infrastructure and equipment upgrades are needed to support high-quality teaching and clinical training. As pediatric subspecialties are developed in Rwanda, there will be corresponding infrastructure and equipment needs. For example, as pediatric oncology capacity is developed, this will require additional laboratory infrastructure, training, and equipment. These specific sub-specialty needs will be determined on an ongoing basis.

Some challenges to high-quality training include:

[8] Ministry of Health (MOH) Rwanda, National Institute of Statistics of Rwanda (NISR), and ICF Marco. 2009. *Rwanda Interim Demographic and Healthy Survey 2007-08.* Calverton, Marlyand, USA.: MOH, NISR, and ICF Macro.

- Inadequate physical space for patient care (number of beds, lack of running water in some);
- Insufficient or non-functional equipment and supplies;
- Insufficient support services (laboratory, radiology);
- Lack of physician work space and consult areas;
- Insufficient educational infrastructure (administrative support, conference rooms, and access to educational resources).

These constraints lead to frustration on the part of the faculty, as they are unable to provide optimal evidence-based patient care, and negatively impact the educational experience of students within the program. Upgrades to equipment and infrastructure through the HRH Program will provide teachers and students with the tools they need to learn and administer optimal pediatric care.

C. Student Targets

The current pediatrics postgraduate training program aims to enroll 10 residents per year, but has not been able to sustain this number in any of the current classes. The major barrier to educating pediatricians is the difficulty in attracting students to a program that is perceived to provide inadequate teaching and mentorship, due to the lack of pediatricians in the country. This is exacerbated by the gaps in teaching facilities and infrastructure, which affect both patient care and education. With improved educational capacity among Rwandan teachers, mentoring from US faculty, and upgrades to clinical training sites regarding infrastructure and equipment, the resident enrollment target will be increased to 16 students per year.

Table 52. Pediatrics First-Year Postgraduate Enrollment Targets, 2012-2018

Program	2011-2012	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Pediatrics	10	16	16	16	16	16	16	16

D. Curriculum and Clinical Rotations

1. Curriculum

Currently, pediatrics postgraduate education is based on a mismatched modular curriculum, with clinical rotation schedules dependent on limited and ad hoc availability of teachers. This curriculum is being revised and modified with the intent of transitioning from a modular system to a competency-based system aligned with national and international standards, with clear learning goals and objectives for the postgraduate program and for each area of focus within the curriculum (i.e.: each rotation). Competencies and clinical guidelines are currently being developed by a curriculum committee. Residency education will be comprised of direct clinical teaching, formal didactic sessions, and self-directed study in each focus area of the curricula.

Point-of-care teaching on the wards and in the ambulatory setting is currently severely limited due to the small number of pediatric professors and lecturers available to teach large groups of trainees at different levels. The small numbers of Rwandan pediatricians are overburdened by numerous responsibilities, including direct clinical care for large numbers of patients, and administrative and secretarial duties. The provision of additional faculty and staff through the HRH Program will allow for (and encourage) more direct clinical teaching. Pediatricians from the US Academic Consortium will augment the current number of teachers available and allow Rwandan physicians more time for point-

of-care teaching. In addition, the US pediatricians will partner with current Rwandan faculty who may not be accustomed to this style of teaching, thereby impacting not only the education of the students, but the culture of medical education within the system.

Postgraduates will be expected to attend regular didactic sessions including teaching rounds and departmental conferences. The curriculum committee will work with the pediatrics department leadership at each teaching hospital to determine the best timing and venue for these sessions. These sessions may be in the form of case presentations (i.e.: morning report) or review of particular topics, and students will be encouraged to participate as presenters as well.

Currently, students and residents are required to participant in independent study. Revision of the curriculum will strengthen this component of their education by providing defined goals and objectives and required reading lists to encourage more focused independent learning and familiarity with medical literature.

A formal evaluation system is also being developed as part of the new curriculum. The system will include evaluation for both students and faculty, to increase accountability and monitor progress. At the beginning of each rotation, trainees including students and residents will be provided with goals and objectives on which they will be evaluated. Clinic preceptors will be expected to provide feedback at regular intervals during rotations with the goal of continuous performance improvement by trainees. Both Rwandan and expatriate teachers will be evaluated by students and by program leadership. Student evaluations will be conducted in a confidential manner in order to ensure honest feedback. These evaluations will be used when considering faculty promotions.

2. Clinical Rotations

Currently, postgraduate students are assigned to a hospital for 6 months to a year at a time, and may not necessarily experience training at all 3 teaching sites. Rotation length and content vary by location, according to faculty and services available. To improve consistency among student clinical experiences, an academic calendar including the order and location of clinical rotations will be developed. Core rotations will be defined by the curriculum committee in collaboration with the US faculty partners, and expectations and competencies for each rotation will be provided to trainees. Elective time, particularly in the 3rd and 4th years, may be used for academic research, foreign study, or subspecialty concentration with Rwandan or expatriate subspecialists.

The postgraduate program will give residents increased responsibility and independence over the course of their four years of study, reflecting increases in knowledge and skills as they progress through the program. In the initial phases of the program, residency training will be based at three current teaching facilities – CHUK, CHUB, and KFH – with short rotations at provincial hospitals to expose residents to community medicine. In order to improve the student-to-teacher ratio, undergraduate medical students may spend the majority of their general pediatrics experience at selected provincial and district hospitals where appropriate supervision and teaching is available. The current student-to-teacher ratio is as high as 16:1 and should be reduced. With investments in infrastructure at the provincial and district hospital level, residency training may also be decentralized in the future.

Through increased faculty and mentors, and upgrades to infrastructure and equipment, the number of active high-quality training sites will be increased to accommodate higher numbers of pediatric postgraduates. Through the HRH Program, clinical training for pediatrics will be expanded to 10 sites by 2019 (Table 53).

Table 53. Clinical Training Sites for Pediatrics, 2012-2019

	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Pediatrics	5	7	9	10	10	10	10

E. Faculty Requirements and US Academic Consortium Involvement

The intent of this program is to create a pool of highly trained general pediatricians and pediatric subspecialists who can train future Rwandan medical students and postgraduates to provide high quality, evidence-based clinical care and pursue research and scholarship in their chosen fields. This will require not only training general pediatricians but also encouraging both generalists and specialist physicians to remain in academic medicine so they can form the next generation of medical educators and researchers.

Currently there are 7 pediatric teaching faculty in Rwanda. Additional specialist physicians are needed to educate even current annual cohorts of 7 pediatric resident physicians and 100 undergraduates, and need to be scaled up further to accommodate the larger cohorts of 16 newly enrolled residents per year starting in 2012. The US Academic Consortium will provide 10 pediatric physicians, including 5 FTE expatriate general practitioners, 2 FTE neonatologists, 1 FTE hematology/oncologist, 1 FTE nephrologist and 1 FTE pulmonologist. These FTE breakdowns will evolve over time, as demonstrated in the table below.

Table 54. US faculty for pediatrics, 2012-2018

	2012	2013	2014	2015	2016	2017	2018
General Peds	5	4	4	3	2	2	1
Neonatologist	2	2	2	1	1	1	0
Intensivist/ER	0	1	1	1	1	1	0
Hematology/Oncologist	1	1	1	1	1	0	0
Nephrologist	1	1	1	1	0	0	0
Pulmonologist	1	1	1	1	1	0	0
TOTAL	10	10	10	8	6	4	1

The general practitioners will be based at three referral hospitals for the first three years of program implementation: KFH, CHUK, and CHUB. As the program quality improves and is scaled up, Rwandan pediatricians will then be able to replace the US general pediatricians at these teaching hospitals. As this occurs, the US faculty will then move to provincial hospitals to assist in establishing pediatric training at these sites (currently none have pediatricians). When the number of trained Rwandan pediatricians remaining in academics is sufficient, then the US involvement will be phased out, over 7 years.

Expatriate general pediatricians will spend an estimated 75-80% of their time on medical education and direct patient care and 20-25% on curriculum development, academic research, and program-related duties. Expatriate subspecialist staff will be expected to spend 75-80% of their time on medical education and clinical care and 20-25% on sub-specialty program development, mentorship, and academic research initiatives. The success of both specialty and subspecialty training will be enhanced through establishment of long-term mentoring relationships.

IV. Surgery and Anesthesiology

A. Current situation

Surgical capacity in Rwanda is insufficient to meet the needs of the country's population. There are only 6 Rwandan general surgeons in the whole country. This personnel shortage is exacerbated by inadequate equipment for surgical services and poor surgical training. Furthermore, primary care physicians responsible for referral of patients for surgical services often lack adequate training in surgical topics. These deficiencies lead to delayed services and a backlog of cases requiring management.

The Rwandan Ministry of Health, Centre Hospitalier Universitaire de Kigali and the University of Virginia have partnered to assess surgical capacity in Rwanda, finding numerous areas for improvement. Although the majority of surgeons practice in Kigali, most surgical procedures are performed in district hospitals, by general practitioners and medical officers. It is imperative to improve capacity for surgical training in Rwanda at both the undergraduate and graduate levels of medical education.

B. Needs and Gaps

1. Workforce Targets

The number of individuals in Rwanda qualified to provide surgical training in both general surgery and specialty areas is insufficient to meet surgical education needs in the country. Exacerbating this shortage is a lack of protected teaching time for surgeons engaged 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 58 surgeons by 2019 (Table 55).

Table 55. Surgery Workforce Targets, 2011-2019

	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
Surgery	14	23	23	27	36	48	60	72	58

2. Infrastructure and Equipment

While surgery shares many infrastructure and equipment needs with other medical disciplines, surgical practice and training also require a number of specialized items that are currently not available in sufficient quantities for teaching, or not available at all. Urgently needed surgical equipment and supplies include: laparoscopes, fluoroscopes, cystoscopes, closed suction drainage equipment, laryngoscopes, anesthesia machines, and colonoscopes.

3. Student Targets

The surgery postgraduate program aims to increase first year postgraduate enrollment from 10 to 13 in the first year of the HRH Program. This enrollment figure will be maintained throughout the program (Table 56).

Table 56. Surgery first-year enrollment targets, 2012-2019

Program	2011-2012	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Surgery	10	13	13	13	13	13	13	13

The surgery program group has noted the importance of providing training opportunities in surgical subspecialties, as well as opportunities for general surgery trainees to be exposed to necessary specialty material. Top students will be targeted for additional subspecialty training. The particular subspecialties and number of students in each will be determined during the Planning Phase of the project.

C. Curriculum and Clinical Rotations

1. Curriculum

The surgical training curriculum is incomplete in both its articulation and implementation at the undergraduate and graduate levels. Improvements must be made in the content of the curriculum, as well as the training methods used and the evaluation of students.

A process of defining the content of the surgical curriculum is being carried out by the Strengthening Rwanda Surgery Advisory Group, a coalition of Rwandan and international partners working to improve surgical capacity in Rwanda. The surgical curriculum must be appropriate to the knowledge and skills required for surgical specialties, and must include the development of appropriate modules for undergraduate as well as postgraduate students.

A variety of methods are necessary for surgical education. Lectures, bedside teaching, simulation exercises, case conferences, and self-directed learning have complementary roles in surgical education, and should be employed in a manner that is appropriate to the knowledge and skills being developed.

While the College of Surgeons in East, Central and Southern Africa (COSECSA) sets certifying examinations for surgical specialties, the surgical training curriculum must provide continuous evaluation and timely feedback to trainees throughout all stages of medical education. A formalized goal-setting process allows for delineation of learning objectives and responsibilities for trainees and trainers, while in-service evaluations (including methods such as written examination, case tracking and standardized bedside observation) provide information on training progress. The mini-CEX (mini-Clinical Evaluation Exercise) and OSATS (*Objective* Structured *Assessment* of Technical *Skills)* have been identified as potential standardized tools for evaluation.

2. Clinical rotations

Clinical rotations must be coherent with the learning objectives delineated in the curriculum. Anticipated sites for surgical training rotations at the initiation of the HRH Program will be existing teaching hospitals in Rwanda: Centre Hospitalier Universitaire de Kigali (CHUK), Centre Hospitalier Universitaire de Butare (CHUB) and King Faisal Hospital (KFH). As additional sites (i.e. District and Provincial Hospitals) develop the capacity to deliver and provide training in surgical procedures, rotations will expand to these sites. This expansion is detailed in the table below.

Table 57. Clinical training sites for surgery, 2012-2019

	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Surgery	5	5	6	7	7	7	7

D. Faculty Requirements and US Academic Consortium Involvement

The number of individuals in Rwanda qualified to provide surgical training in both general surgery and specialty areas is insufficient to meet the surgical education needs in the country. Exacerbating this shortage is a lack of protected teaching time for surgeons engaged 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. It is noted that the Continuing Professional Development program recently launched by the Rwanda Medical Council will provide opportunities for skills and knowledge development among faculty.

US partner universities will commit to recruiting mentors to reflect needs in surgical training capacity within Rwanda. In the short term, US mentors will provide training to residents within Rwandan surgical training programs. Concurrently, mentors will also work to develop the clinical, teaching and research capacity of surgical faculty in Rwanda. A key medium-term goal within this partnership will be to achieve local capacity to train surgical specialists by year five of the program. Specifically, clinical, teaching and administrative capacity will be adequate to begin accepting specialty trainees for fellowship training by Rwandan faculty.

The total number of surgical faculty must be adequate for the education of approximately 80 concurrent residents. A feasible and acceptable trainer: trainee ratio of no greater than 4:1 has been identified by the surgery working group, requiring 20 active trainers. With 11 Rwandan surgical trainers presently available, a minimum of nine US mentors must be continuously provided by the Consortium. Table 58 below outlines the total number of US Academic mentors during the course of the HRH Program.

Table 58. US Faculty for Surgery, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Surgery	10	10	10	7	6	4	2

Regarding clinical expertise, the specialties of US mentors will be appropriate to local needs and program curricula. Recruitment and deployment of US mentors will initially reflect the following structure:

- 3/10 general surgery (acute care/trauma)
- 2/10 orthopedics/spine
- 1/10 urology
- 1/10 neurosurgery
- 1/10 modular subspecialties

Notably, an ongoing training relationship with a German partner provides mentorship in ENT at CHUK, supporting the matriculation of two residents per year. It will be important to identify existing training partnerships and ensure that training provided through the Consortium works with these in a complementary and cooperative manner. Furthermore, it is known that Rwandan physicians are currently engaged in surgical training abroad, and the future involvement of these physicians as practicing and teaching faculty members within Rwanda must be considered.

Medium and long-term mentorship periods (i.e. ≥1 year) have numerous benefits, including harmonization with local institutions and staff as well as rich mentorship relationships with trainees. Meanwhile, shorter mentorship periods may in some cases facilitate the recruitment of staff from US institutions for the delivery of specialized areas of training. Matching US mentors with Rwandan faculty will enable mentorship in clinical practice, teaching, and research.

The development of academic/clinical specialties within the Department of Surgery will proceed in a stepwise fashion, with core Sections to be established in 2012 (Phase I), and further specialties to be added in subsequently (Phases 2 and 3). This sequence is detailed below.

Table 59. Surgery faculty development scheme

Phase	Specialty
1 (2012-2013)	General surgery (with trauma, acute care)
	Orthopedics/spine
	Neurosurgery/spine
	ENT (with plastics, maxillofacial)
	Urology
2 (2014-2016)	Thoracic surgery
	Pediatric surgery
3 (2017-2018)	Surgical oncology
	Plastic surgery

By the penultimate year of the partnership (2017), Rwandan faculty expertise in surgical specialties will be sufficient to carry out fellowship training in-country. A role for information technology is foreseen in the facilitation of remote mentorship of faculty. Rwandan faculty will be encouraged and supported in their pursuit of COSECSA certification, as it is believed that this will enrich training programs and encourage trainees to pursue certification.

E. Anesthesiology

Capacity for surgical practice and training is closely linked to capacity for anesthesiology, which is also lacking in Rwanda. The HRH Program will jointly address surgery and anesthesia training needs in order to improve access to these services. While anesthesia could not be addressed as a separate field during the May 2011 HRH meeting, US institutions will provide faculty in anesthesiology to HRH Program. These faculty and their Rwandan counterparts will be developing a more detailed plan for the anesthesiology training program in the coming months. However, initial targets based on needs in Rwanda are detailed below.

Table 60. Anesthesiology First year Enrollment Targets, 2012-2019

Program	2011-2012	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Anesthesiology	6	6	6	6	6	6	6	6

By 2012, and continuing to 2018, 6 anesthesiology postgraduates will be enrolled each year (Table 61). These enrollment targets feed into the workforce targets presented in Table 62 below. By 2018, there will be 39 anesthesiologists in the Rwandan workforce, an increase of 28 from the start of the program.

Table 61. Anesthesiology workforce targets, 2011-2019

	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
Anesthesiology	11	16	16	19	24	29	34	39	28

To support this scale-up, 4 mentors in anesthesiology will be recruited for each year of the HRH Program (Table 62). A strong existing Canadian partnership also provides anesthesiology training in Rwanda, and there is potential for development of training partnerships with institutions within the US Consortium.

Table 62. US faculty for anesthesiology, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Anesthesiology	4	4	4	2	2	2	1

At clinical training sites, anesthesiology suffers from similar infrastructure and equipment challenges as surgery, and other specialties. Equipment maintenance is a significant barrier to training and provision of care, as equipment is often purchased without a reliable service and maintenance contract. Specific equipment needs, such as laryngoscopes, bag-valve-masks, airway tubes, ventilators, and monitoring equipment (pulse oximetry, telemetry) will be factored into the detailed HRH Program assessment. Reliable availability of this equipment will be used as a measure to designate clinical training sites. There will be two clinical training sites for anesthesiology throughout the HRH Program.

Table 63. Clinical training sites for Anesthesiology, 2012-2019

	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Anesthesiology	2	2	2	2	2	2	2

V. Family and Community Medicine

While specialization in Rwanda's very basic healthcare workforce is essential, the health and well being of the population is also highly dependent on a good quality primary health care system, which is easily accessible and affordable to all members of the community. This is the foundation of the declaration of Alma Ata, "Health for All" adopted by the World Health Organization in 1978 and reiterated in 2000. A health care system based on primary health care has been proven to be cheaper and to have better overall health outcomes. In Rwanda, general practitioners have such low levels of training that further training is required to produce high quality primary health care providers. The concept of the postgraduate-trained Family and Community Physician to deliver this high quality primary health care is now the norm in many countries of the world. However, in Sub Saharan Africa family and community medicine is still a relatively new concept, and in Rwanda, this Family and Community Medicine is a brand new program, accepting its first cohort of students in July of 2011.

A. Current situation

The vision of the Family and Community Medicine (FAMCO) Department is to improve the total health of individuals and families in Rwanda, which will contribute to overall socio-economic development. This will be done through training Rwandan physicians to be competent in providing comprehensive, continuous, person-centred, family-oriented and community-based quality health care using the bio-psycho-social model of care.

Training family physicians fills an important gap, as district hospitals and health centers in Rwanda are often staffed with newly graduated general physicians with only 1 year of internship training, who have not had the benefit of supervised postgraduate training considered essential in most effective health care systems. These physicians face the daunting challenge of dealing with a great variety of problems —some of whose management has not been clearly defined in rural Africa—and of doing so in a resource-poor setting. This leads to poor quality of patient care, high rates of burn-out among the staff, and a high percentage of physicians moving back to the big cities (where 20% of the population lives but where 80% of the physicians work) at the end of the two-years mandatory rural health service, which leads to a chronic lack of ongoing leadership in the health districts. Simply put, Rwandan medical graduates do not spend enough time being closely supervised by more experienced senior physicians to be effective change agents for improving the overall health of the Rwandan people.

The profile of the Rwandan FAMCO training at the National University of Rwanda (NUR) has been modelled on similar programs in neighbouring East African countries such as Kenya and Uganda, and follows international standards. Curriculum development started in 2006 with the support of the Ministry of Health. The training is fully accepted by the Ministry of Health as one of the MMed specialty programs offered by the NUR. The first intake of residents in the FAMCO program was in 2008 (7 residents), who are presently in their third year of training. In 2009 none of the MMed programs had any intake of new residents. The second batch of residents (5 residents) started their training in 2010. There are currently no Rwandan family physicians in Rwanda, as the first intake will be graduating in 2012. Seven medical doctors have applied for the FAMCO training for the year 2011. This group will start in July 2011.

In December 2009 a workshop with Ministry of Health, other specialists, family physicians from surrounding countries and other stakeholders was organised to clarify the definition, roles and responsibilities and the position of family physicians in the Rwandan health care system. FAMCO is training their residents to become the leaders of the Rwandan district health care system of tomorrow.

The mission of the FAMCO postgraduate program (MMed) is to produce Rwandan family physicians, based in the district hospitals and reaching out to the community, who demonstrate the following characteristics:

- Medical expertise in the most common health problems of Rwanda and of Africa, expertise in preventative health care and chronic disease management, and excellent clinical decision making. The Rwandan Family and Community physician is not expected to be a complete surgeon, paediatrician, internist, or obstetrician, but to be a "Specialist of the Common Problems", which account for up to 85-90% of all the health problems encountered in the community;
- Effective communicator, especially in the development of a therapeutic relationship with patients and their families and in communicating with other physicians and health care workers;
- Collaborator with a team of local health care providers and referral specialists;
- Excellent clinical teacher and mentor of FAMCO residents, other specialists, GPs, medical and other health care related students, nurses and other healthcare workers;
- Advocate for the health of his/her patients and community, with attention to programs and interventions that address their most common health problems;
- A capable scholar with a practice of life-long learning and personal continuing education, who is also able to contribute new information and knowledge through scholarly work and research;
- A medical professional who delivers the highest quality care possible with integrity, honesty, compassion, and strong ethical principles.

The FAMCO postgraduate training is a four-year program. The training starts with common courses organised for all MMed programs by the NUR in Butare for 6 months. After these introductory courses the residents go to a district/ provincial training site for their clinical rotations. Ideally the training sites will have at least two family physicians and at least one specialist in each of the four main areas (surgery, internal medicine, obstetrics/gynaecology and paediatrics), to provide training and mentoring for the residents. Presently three district hospitals are used as training sites for the program; Ruhengeri, Kabgayi and Rwinkwavu hospital, each with one family physician faculty present. The Ministry of Health will upgrade Ruhengeri and Kabgayi hospitals to provincial status in the near future.

B. Needs and Gaps

1. Workforce Targets

As there are currently no FAMCO physicians in Rwanda, rapid scale-up is necessary to meet the country's primary care needs. Over the course of the HRH Program, 69 new FAMCO physicians will be trained (Table 64). Some of these will go on to become faculty, training the next generation of the FAMCO practitioners.

Table 64. FAMCO Workforce Targets, 2012-2019

	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
FAMCO	0	7	7	12	21	37	53	69	69

2. Infrastructure and Equipment

While FAMCO requires mostly basic medical equipment for primary care, even these tools are not available in the quantity and condition required to provide high quality care and, as an extension, high

quality training. Equipment and infrastructure include needs as basic as examination tables and blood pressure cuffs, as well as more advanced equipment needed by FAMCO practitioners, such as defibrillators. As with other specialties and health cadres, more detailed assessments of infrastructure and equipment needs will be conducted during the planning phase of the program.

3. Student Targets

The Ministry of Health aims to have 2 family physicians in each district hospital. As there are 41 district hospitals in Rwanda, it will take 9 years to reach the needed number of family physicians with an intake of 18 residents per year (Table 65).

Table 65. FAMCO First year Enrollment Targets, 2011-2018

Program	2011-2012	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
FAMCO	10	18	18	18	18	18	18	18

C. Curriculum and Clinical Rotations

1. Curriculum

The existing curriculum, with rotations, is shown in the table below. The residents have 30 days of leave per year.

Table 66. FAMCO postgraduate clinical rotations in weeks (number of weeks in parentheses)

Year 1	Year 2	Year 3	Year 4
Common Courses (6)	Community Med (4)	Ob/Gyn (6)	ENT (4)
Internal Med -Butare (4)	Internal Med (8)	Surgery (8)	Research Project / Dissertation II (2)
Internal Med - District (6)	Surgery (8)	Peds (6)	Internal Medicine (6)
Surgery – Butare (4)	Ob/Gyn (8)	Internal Medicine (8)	Surgery (6)
Surgery – District (8)	Peds (8)	Ophthalmology (2)	Elective (4)
Ob/Gyn – Butare (4)	Workshops in Kigali (6)	Workshops in Kigali (6)	Dermatology (4)
Ob/Gyn – District (8)	Laboratory (2)	Radiology (2)	HIV/AIDS (2)
Peds - Butare (4)	Psych (4)	Research Project / Dissertation I (2)	Workshops in Kigali (6)
Peds - District (6)	Leave (4)	Ortho (4)	Ob/Gyn (4)
Workshops in Kigali (6)		Elective (4)	Peds (6)
Leave (4)		Leave (4)	Elective (4)
			Leave (4)

Since this is a new specialty in Rwanda, many lessons have been learned in the last 3 years regarding the effectiveness of the FAMCO curriculum. A curricula revision and program planning initiative will take place in 2011. There will be several important steps in this process:

1) The place of family medicine in the Rwandan health care system and the role of the Rwandan family physician specialist will be clarified to inform the revision of the curriculum. A workshop with the different stakeholders will be organised as soon as possible. The stakeholders will

include representatives from the Ministry of Health, NUR, RUHMS, academic FAMCO faculty and current FAMCO residents.

2) The core competencies of the graduated family physicians will be reviewed and revised in accordance to the role of family medicine specialist in the Rwandan health care system, as determined in the stakeholder workshop described above.

3) The existing postgraduate curriculum developed in 2008 will be revised to reflect the core competencies needed by the graduated family physician in Rwanda. This curricula revision will be done with significant input from the present 3rd year residents.

4) A clear work-plan to implement the revised curriculum will be drafted.

5) An African consortium of family medicine training institutes will be formed and will assist in ongoing future curriculum revisions.

6) Practical teacher training manuals, tailored to the Rwandan family physician, needs to be formally created from the existing lecture materials used in the FAMCO program.

7) A teaching-to-teach curriculum needs to be developed for senior residents.

Another important component of the curriculum is evaluation. Presently the NUR requires 3 examinations during the 4 year MMed program, as well as after years 1, 2 and 4. The exams are composed of a knowledge exam MCQ (100 Q) and a clinical evaluation (OSCE-based). A clinical skills evaluation is also done. Formative evaluation is also carried out to help postgraduates improve as they go. The residents keep a logbook of procedures done and patients seen, and rotation evaluation forms are completed by the clinical mentors. Residents answer weekly clinical reflection questions and also complete weekly self-directed learning through a weekly assigned article with a self-assessment knowledge questionnaire.

To ensure that the FAMCO program is meeting the needs of its students, an evaluation of the program will be completed by the residents. This questionnaire will be developed and will be implemented annually. This will help with ongoing monitoring of quality and with future curriculum revisions. Additionally, to ensure a high quality of teaching, FAMCO mentors and teachers will be evaluated by other teachers and by the residents. These evaluation tools will be developed during the Planning Phase of the HRH Program, and reviewed on an annual basis by the FAMCO residency sub-group.

2. Clinical Rotations

Academic family physicians are based in the provincial and district hospitals to provide clinical teaching and mentoring to the FAMCO residents. Specialists from other disciplines, especially the other MMed specialties, are essential for high quality training of the FAMCO residents. Ongoing collaboration will be emphasized as the volume of FAMCO residents increases. FAMCO residents will be trained in clinical teaching and mentoring of junior residents, medical students and other health care professionals.

Clinical rotations will be completed at an increasing number of sites as the faculty and equipment needs are met at an increasing number of upgraded sites. A minimum of 4 and a maximum of 12 residents can be trained per training site at the same time to create an optimal learning and teaching environment.

There are currently 3 active training sites, but this number will be increased to 8 over the course of the program to support the increased number of postgraduates (
Table 67).

Table 67. FAMCO clinical training sites, 2012-2019

	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
FAMCO	5	7	8	8	8	8	8

D. Undergraduate program

Currently the main focus of the Family and Community Medicine (FAMCO) Department is the postgraduate FAMCO (MMed) program. However to improve the availability and expertise of family medicine specialists in the Rwandan health care system, undergraduate education in the FAMCO department must also be developed.
The undergraduate program will be developed in conjunction with the postgraduate program. This will increase knowledge of primary care and community health in all medical students. Training will include:

- Doc II: one month FAMCO teaching program in the class room
- Doc IV: two months FAMCO clinical rotation in a district training site
- Longitudinal community health training at the health centres
- Didactics in cross-cutting/cross-disciplinary topics like communication skills, ethics, professionalism, geriatrics, palliative care, etc.

E. Faculty Requirements and US Academic Consortium Involvement

Presently there are no Rwandan family physicians. The goal of this program is to rapidly develop a teaching and academic workforce staffed by Rwandan family physicians to make the program as sustainable as possible. In the first years of the program expatriate family physicians will serve as educators. Select senior Rwandan residents have already been targeted as future faculty members. Each year two of these residents will be recruited and will undergo a 3-month external faculty development fellowship, possibly in South Africa, after graduation to prepare them for their role in the FAMCO department. Once they join the program as faculty, junior faculty will be paired with FAMCO senior faculty for intensive mentorship in teaching methods.

When a critical mass of faculty has been developed to cover post-graduate and undergraduate teaching needs, academic family physicians can also engage with other education programs. For example, these faculty members can offer clinical training to other MMed specialist residents in cross-cutting topics such as preventive medicine, communication skills, behavioural skills, ethics, chronic disease management, palliative care, geriatrics, community medicine, psycho-somatic/ mental health, clinical pharmacology, teaching skills, and professionalism. Training manuals for these different topics need to be developed for ongoing use by the new Rwandan academic family physicians. Supplemental training of local interns and residents from other MMed specialties at district and provincial hospitals is another function that faculty could fulfil in the future, in cross cutting topics such as: preventive medicine, communication skills, behavioural skills, ethics, chronic disease management, palliative care, geriatrics, community medicine, psycho-somatic/ mental health, clinical pharmacology, teaching skills, and professionalism. Finally, continuing professional development and/or continuing medical education is needed to maintain high quality clinical skills after

graduation, and both general practitioners and FAMCO physicians can benefit from this type of training by academic FAMCO physicians.

Mentors from US Academic institutions will be recruited to support the development of the FAMCO program. These assumptions are outlined below.

Table 68. US faculty for FAMCO, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
FAMCO	6	6	6	6	4	2	1

Primarily, recruited faculty will be US family physicians. However given the difference in scope of practice of US family physicians vs. African family physicians, it may be necessary to consider hiring expat faculty members from South Africa or other countries. However all expat family physician teachers need to be vetted by the US academic institutions and may only be approved if considered acceptable as teachers for residents in their own department. Each mentor in the table above will stay in Rwanda for a minimum of one year. The need for short-term teachers is limited and will be specifically targeted.

VI. Emergency Medicine

Emergency medicine (EM) is one of the fastest growing medical specialties worldwide, now recognized in nearly 70 low, middle, and high-income countries. Emergency physicians generally work at the hospital level, providing initial triage and stabilization for patients with a wide variety of medical, surgical, and traumatic conditions at all times of day and night. In most countries, emergency physicians also provide supervision and direction for pre-hospital emergency medical services (EMS) systems, as well as help coordinate disaster and emergency response at the local and national level.

Injuries now account for nearly 10% of all deaths worldwide, more than HIV/AIDS, TB, and malaria combined, with this proportion expected to grow over the next several decades.[9] Injuries, and especially road traffic accidents, are an important contributor to death and disability in Rwanda.[10] Improved access to emergency care and EMS systems could significantly reduce the disproportionate burden of death and disability due to trauma that Rwanda and other low-income countries experience. Therefore, like many other low and middle-income countries, Rwanda has recognized the need for specialty training in Emergency Medicine in order to produce a cadre of physicians who can meet the growing need for rapid and cost-effective acute medical and trauma care. Like Family and Community Medicine, Emergency Medicine represents an entirely new specialty for Rwanda, with more intensive program development in the first years of the HRH Program than the established specialty programs.

A. Current situation

Currently, there are no practicing emergency physicians or EM training programs in Rwanda, though several emergency medicine residency programs have opened up in other sub-Saharan African countries in recent years. However, there is a strong interest among many Rwandan medical students and recent graduates for specialty training in emergency medicine, as well as a strong interest among Rwandan hospitals to improve the delivery of emergency care at their institutions.

While most of the referral and provincial level hospitals in Rwanda have emergency departments (ED), they are generally staffed by recently graduated general practitioners with minimal training or exposure to acute care or trauma care, and with very limited physician coverage overnight. For instance, the ED at CHUK is quite busy, as it receives patients referred from district hospitals all over the country. Unfortunately, it lacks the human resources or equipment necessary to meet the challenges of caring for so many acutely ill patients. Currently the CHUK ED does not have a stable core of physicians who are able to respond to the many different types of emergency cases that present there, supervise medical students and junior staff, coordinate with other services, and work to prevent the stock-out of essential drugs and equipment.

At the district hospital level, emergency departments are largely absent, and no formal means exist for triaging patients who arrive with potentially life threatening medical and surgical conditions. In addition, while Rwanda in general has a rapidly growing EMS system, with many new ambulances being added each year, there is a significant need for improved physician direction, oversight, and training of paramedical workers in order to maximize the effectiveness of the EMS system. Finally, there is a need for a trained cadre of emergency physicians who can direct response at the local and national level to future natural or man-made disasters that may occur in Rwanda.

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[9] WHO, 2010.
[10] Nsereko, 2010.

B. Needs and Gaps

There is currently no EM residency program in Rwanda. Therefore, in order to introduce the specialty of Emergency Medicine in Rwanda, a new residency program will have to be created, likely modeled on successful EM training programs in other African countries.

In addition to creating a new EM residency program and recruiting faculty to administer it, a new curriculum will have to be designed specifically for this training program. The curriculum can be based on standard EM residency curricula from the US, Europe, and South Africa, but it will have to be adapted to fit the local resources and needs of Rwanda.

1. Workforce Targets

Because there are currently no EM physicians in Rwanda, the workforce will take several years to build as new students progress through the postgraduate program. While the program will initially be entirely dependent on US faculty, the new Rwandan graduates will be trained as instructors as well as practitioners to eventually replace the expatriates. By 2018, there will be 6 Rwandan EM physicians (Table 69).

Table 69. Emergency medicine workforce targets, 2012-2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 19)
Emergency Medicine	0	0	0	0	0	0	0	3	6	6

2. Infrastructure and Equipment

Finally, there will be a need to purchase additional equipment and training materials for the new EM residency program in order to ensure a high-quality training environment for Rwanda's first emergency physicians. While the location of the new EM residency program has yet to be determined, it will most likely be located at CHUK, which sees large numbers of emergency patients and high amounts of trauma. While an emergency department currently exists at CHUK, new infrastructure and supplies will need to be purchased in order to raise it to an adequate level to host an emergency medicine residency program. Equipment specific to emergency medicine includes resuscitation equipment, portable x-ray machines, and portable ultrasounds.

3. Student Targets

The new residency program in Emergency Medicine will begin in 2013 with 3 residents per year. This enrollment rate will be maintained through 2018.

Table 70. Emergency Medicine First Year Enrollment Targets, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Emergency	0	3	3	3	3	3	3

C. Curriculum and Clinical Rotations

1. Curriculum

The curriculum for the new EM residency program will be designed to prepare trainees to meet the core competencies for emergency medicine, as described by the American Board of Emergency Medicine (ABEM) EM Model and the European Society for Emergency Medicine (EuSEM) European Curriculum for Emergency Medicine. We anticipate that the curriculum will include a mix of didactic lectures, hands-on simulation, and clinical rotations both in the emergency department and other relevant departments.

a. Didactics

A regular didactic schedule will be established for the EM residents that cover the core knowledge and skills necessary for EM practice (see Box 1 below). The residents will be relieved of clinical duties one morning each week in order to participate in lectures and small group discussions. Initially most lectures and discussions will be led by expatriate EM faculty. In addition, we would seek to draw upon expatriate and Rwandan faculty from other disciplines to help supplement these lectures with topics particular to their area of expertise. Over time, Rwandan EM faculty will begin to take over lectures. In addition, we anticipate that each resident will be required to give a certain number of lectures each year to their colleagues in order to help prepare them for a future academic career.

Box 1: Core Knowledge in Emergency Medicine

1 Cardiovascular Emergencies in Adults and Children
2 Dermatological Emergencies in Adults and Children
3 Endocrine and Metabolic Emergencies in Adults and Children
4 Fluid and Electrolyte Disturbances
5 Ear, Nose, Throat, Oral and Neck Emergencies in Adults and Children
6 Gastrointestinal Emergencies in Adults and Children
7 Gynecological and Obstetric Emergencies
8 Hematology and Oncology Emergencies in Adults and Children
9 Immunological Emergencies in Adults and Children
10 Infectious Diseases and Sepsis in Adults and Children
11 Musculoskeletal Emergencies
12 Neurological Emergencies in Adults and Children
13 Ophthalmic Emergencies in Adults and Children
14 Pulmonary Emergencies in Adults and Children
15 Psychiatric and Behavior Disorders
16 Renal and Urological Emergencies in Adults and Children
17 Trauma in Adults and Children

b. Simulation Training

Simulation is a training tool gaining popularity in medical education in general, and emergency medicine in particular, across the developed and developing world. We plan to incorporate simulation training, as feasible, into the Rwandan EM residency curriculum. This will include low fidelity simulation, such as case discussions or role playing, as well as higher fidelity simulation

involving the use of mannequins, models, and computer programs to simulate emergency medicine procedures and techniques.

c. Point-of-Care Ultrasound Training

The use of bedside ultrasound performed by non-radiologists world-wide is gaining increasing recognition as a useful, highly accurate tool to improve diagnosis and patient safety, and has become a required component of most emergency medicine residency training programs in developed countries. Point-of-care ultrasound can be particularly useful in the developing world where access to formal radiology may be limited. Due to increased portability, affordability and durability of hand-carried ultrasound, Rwanda has implemented ultrasound services in many district hospitals with success. Ultrasound skills will be presented through formal didactics and supervised practice, then the residency candidates will be required to save images from ultrasounds performed independently for faculty review. We aim to include the following types of emergency ultrasound into the curriculum:

1) Cardiac: Identification of pericardial effusion, Left Ventricular Systolic Dysfunction;
2) Trauma: Identification of intra-abdominal and intra-thoracic bleeding;
3) Pulmonary: Identification of pneumothorax, pleural effusion;
4) Obstetric: Identification of Intrauterine Pregnancy, Estimation of Gestational Age;
5) Renal: Identification of hydronephrosis;
6) Shock: Identification of volume depletion using imaging of Inferior Vena Cava;
7) Procedural: Marking site prior to paracentesis or thoracentesis using ultrasound to improve safety, using ultrasound guidance for peripheral venous access in difficult patients;
8) Vascular: Assessment for deep venous thrombosis of the lower extremities;
9) Skin and soft tissue: Identification abscess and pyomyositis.

2. Clinical Rotations

The curriculum will include 12 four-week clinical rotations, as well as 4 weeks of vacation each year, for a total of 36 clinical rotations over the three-year residency period. The clinical rotations will include a mix of emergency medicine, “off-service”, and elective rotations (See Table 1). We anticipate that most of the clinical rotations will take place at CHUK, as it has the highest patient volume of any referral hospital and the greatest mix of emergency cases, though the ICU rotations will likely take place at King Faisal Hospital. In addition to their other off-service rotations, residents will spend one month during their second year gaining EMS training by participating in an ambulance service and through focused didactics. Residents will also spend 3 months during their second year rotating through an established EM program in another country, likely South Africa, in order to deepen their understanding of the field. In addition, there will be a teaching/administrative rotation during the 3rd year where senior residents will be prepared for future roles as emergency medicine faculty and leaders within Rwanda. During their two elective blocks, EM residents will have the opportunity to pursue emergency medicine or related specialty rotations at other hospitals in Rwanda in order to increase the breadth of their training. We

would require that they spend at least one of these months at a District Hospital, in order to learn about providing emergency care in rural settings.

Table 71. Emergency medicine clinical rotations

First Year	Second Year	Third Year
Emergency Medicine (6) Pediatrics (1) Anesthesia (1) Medical ICU (1) Obstetrics (1) Orthopedic Surgery (1) Trauma Surgery (1) Ultrasound (1)	Emergency Medicine (6) Foreign EM Rotation (3) Pediatric/Neonatal ICU (1) EMS/Ambulance Service (1) Elective (1)	Emergency Medicine (9) Teaching/Admin (1) Elective (2)

D. Faculty Requirements and US Academic Consortium Involvement

The program will initially draw heavily upon the skills of expatriate emergency medicine faculty and upon local Rwandan faculty with specialty training in other related disciplines.

As mentioned above, there are currently no Rwandan physicians with emergency medicine training. In order to train the first generation of Rwandan emergency physicians, we will need to recruit a mix of expatriate emergency physicians and Rwandan physicians with specialty training in other related fields, such as anesthesiology, surgery, or family medicine, to serve as faculty for our new EM residency program. We also hope to utilize expatriate physicians from other specialties who can provide lectures on specific topics to our emergency medicine residents.

As evident in Table 72 below, we recommend two full-time expatriate emergency physician faculty starting in 2013, who can help finalize the curriculum and launch the emergency medicine residency. We will then continue to have two full-time expatriate emergency medicine faculty in Rwanda to supervise residents, organize and lead didactic and simulation sessions, and provide mentorship to the emergency medicine trainees in 2014, 2015, and 2016. Beginning in 2016, we expect to graduate 3 Rwandan emergency physicians each year from the residency program, and hope to retain at least one as faculty for the residency program. As such, the number of expatriate emergency physicians will decrease to 1 in 2017 and 0 in 2019. The expatriate emergency physicians will each spend about 75% of their time clinically supervising residents in the emergency department, and 25% developing didactic materials and delivering lectures, as well as mentoring residents outside of the clinical environment.

Table 72. US faculty for emergency medicine, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Emergency Medicine	0	2	2	2	1	1	1

In addition to the 2 expatriate emergency physicians, we believe it will be necessary to have an additional 1-2 Rwandan faculty with specialty training in another field, in order to provide for at least 3-4 full-time faculty for the residency program throughout its existence. In order to provide these Rwandan faculty members with some of the basic skills needed to supervise emergency medicine residents, we believe it would be helpful for each of the Rwandan faculty to spend at least 3 months at an established EM residency program

in another country, such as one of the South African EM residency programs, likely in 2012. Similar to the expatriate emergency medicine faculty, we would expect the Rwandan faculty to spend about 75% of their time supervising residents in the emergency department and 25% developing teaching materials, delivering lectures, and mentoring residents.

Finally, expatriate specialists and subspecialists recruited for the other residency programs, including pediatric emergency physicians and intensivists, obstetricians, anesthesiologists, general surgeons, orthopedists, family physicians and internal medicine subspecialists will be invited to deliver select lectures to residents as part of their didactic curriculum.

VII. Other Specialties

In addition to the six main specialties and emergency medicine, five additional specialties will receive support through the HRH Program: neurology, psychiatry, radiology, ENT, and pathology. The Ministry of Health has identified these as priority specialties, however, there are very few physicians currently trained in these areas. To launch formal training programs, full-time US faculty will be recruited, as outlined in Table 73. They will phase out as they are replaced by new Rwandan specialists.

Apart from the modular training in different sub-specialty areas for Internal Medicine, Pediatrics, Surgery, and Obstetrics/Gynecology, there is a need for a Rwandan in two priority subspecialties: orthopedics and oncology. These subspecialties have the potential to develop into full postgraduate programs: Kanombe Military Hospital currently has a Center of Excellence in Orthopedics and is developing a Center Of Excellence in Oncology. However, there are currently insufficient Rwandan oncologists and orthopods to staff postgraduate programs. Therefore, in addition to the US subspecialists in these areas that will be deployed to the Internal Medicine and Surgery Departments, additional US faculty are needed in these areas to develop the subspecialist postgraduate programs at Kanombe Military Hospital. These brand new programs require substantial planning and coordination. During the Planning Phase, curricula and clinical rotations will be devised, faculty requirements and deployment will be determined, and student recruitment will be planned.

Table 73. Workforce Targets for Additional Specialties, 2012-2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 19)
Oncology	0	0	0	0	0	0	3	6	9	9
Neurology	2	2	2	2	2	2	2	5	8	6
Orthopedics	7	7	7	7	7	7	7	10	13	6
Psychiatry	3	3	3	3	3	3	6	9	12	9
Radiology	5	5	5	5	5	5	5	8	11	6
ENT	0	0	0	0	0	0	0	3	6	6
Pathology	0	0	0	0	0	0	0	3	6	6
Total	**17**	**17**	**17**	**17**	**17**	**17**	**23**	**44**	**65**	**48**

Table 74. Enrollment Targets for First-Years in Additional Specialty Postgraduate Programs, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
ENT	0	3	3	3	3	3	3
Neurology	0	3	3	3	3	3	3
Oncology	3	3	3	3	3	3	3
Orthopedics	0	3	3	3	3	3	3
Pathology	0	3	3	3	3	3	3
Psychiatry	3	3	3	3	3	3	3
Radiology	0	3	3	3	3	3	3
TOTAL INTAKE	**6**	**21**	**21**	**21**	**21**	**21**	**21**

Table 75. US Faculty Requirements, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
ENT	0	2	2	2	2	2	1
Neurology	0	2	2	2	2	2	1
Oncology	1	2	2	2	2	1	0
Orthopedics	0	1	2	2	2	1	1
Pathology	1	2	2	2	2	1	1
Psychiatry	1	1	1	1	1	1	0
Radiology	1	2	2	2	2	1	0
TOTAL	**4**	**12**	**13**	**13**	**13**	**9**	**4**

This section details the approach that will be used to train, mentor and/or recruit new and existing Rwandan medical faculty, to ensure that investments in the medical education system through the HRH Program are sustained beyond the engagement of the US Academic Consortium.

A. Current Situation

A key component of the HRH Program is to produce a sufficient number of high quality faculty to train Rwanda's healthcare workforce into the future. While clinical mentorship from US institutions and upgraded infrastructure and equipment will help to educate high quality physicians, a detailed strategy is needed to train effective Rwandan faculty members.

The Ministry of Health currently expects that clinicians will provide bedside teaching for postgraduates and undergraduates on rotation. In practice, this is not always the case. Some clinicians hold faculty appointments as University staff, while others teach students but do not have faculty appointments nor any other additional recognition and incentives. Clinicians in teaching hospitals also do not have protected teaching time and are often overburdened with clinical and administrative duties, with little or no time to teach students.

During the Planning Phase of the HRH Program, the Ministry of Health will host a workshop with representatives from the Faculty of Medicine, the teaching hospitals, the Ministry of Health, and the US institutions from the Academic Consortium. The objective of the meeting is to develop an operational plan for training the future faculty of Rwanda. More specifically, participants in the workshop will:

- Clarify the role of clinical mentors in teaching hospitals and rationalize the system for faculty appointments.
- Define the type and number of faculty (specialist and subspecialist) needed in each clinical area.
- Define faculty targets to be filled over the next 7-10 years.
- Harmonize the Rwandan faculty development model with regional partners in the EAC to facilitate exchange opportunities.

The approach to physician faculty training which will guide these discussions is provided below.

B. Proposal for Physician Faculty Training for the Rwanda HRH Program

Through the HRH Program, existing faculty in Rwanda will improve their teaching skills and new specialist and subspecialist faculty will be trained to support the postgraduate programs into the future. FOM

appointments will be extended to more clinical mentors in the teaching hospitals, reflecting and rewarding actual teaching duties, and absorbing the new cadre of high quality clinician educators. Three different groups of Rwandan faculty will be trained in different ways: (a) in-country mentorship and training of existing faculty; (b) in-country mentorship and training of new faculty; and (c) subspecialty training of select new or junior faculty. US faculty will also have the opportunity to learn from the clinical experience of the Rwandan partners, helping them to better mentor Rwandan students and creating a partnership where both are teachers and learners.

1. In-country mentorship of current Rwandan faculty

Clinicians serving as clinical mentors in Rwanda have received little to no formal training in mentorship to date. While some of these individuals have years of experience in clinical practice, they are not always effective as medical educators and mentors. US mentors will be paired with these clinicians to strengthen academic and mentorship skills. US mentors will meet regularly with their Rwandan teaching partners to share planned lectures, tutorials and practical sessions and to discuss teaching strategies.

This also should be complemented by well-designed workshops focusing on pedagogical skills (teaching how to teach, evaluation and feedback, etc.) and skills and knowledge critical for effective mentorship and teaching (principals of evidence-based medicine, clinical epidemiology, medical ethics and professionalism, medical writing, application of basic genetic and molecular biology principals to clinical decision making, etc).

2. In-country mentorship of new Rwandan faculty

To ensure the continuation of high quality medical education into the future, new educators are urgently needed, both in specialty and subspecialty roles. New educators will come from the pool of new graduates from the residency programs. Talented students will be identified as early as possible to be tracked as potential future faculty members, receiving special attention and mentoring during their training. For the core specialties, these new faculty members can largely be trained in Rwanda.

At the undergraduate level, highly performing students in the fourth, fifth and sixth years will be identified and assigned mentors in their fields of interest. Upon graduation, these students will be given the option to waive their two year District Hospital service requirement, directly enrolling in postgraduate training programs. High potential postgraduate students will be identified early on, in the first year or two of their residency. Once an individual is identified as a potential faculty member and has shown interest, a contract will be drawn up, defining both the training process and commitment to and from the individual as a future faculty member. Individuals in this priority program would be obligated to remain as full-time faculty members for a pre-defined period.

Postgraduate faculty candidates will be paired with senior Rwandan and US mentors in their fields to help grow their competencies as clinicians and medical educators. These residents will be given leadership roles in their cohorts and will take on increasing levels of responsibility for mentoring younger students, while attending faculty development sessions organized by US mentors and senior Rwandan faculty. Additionally, academic capacities will be developed by providing faculty candidates with advising and funding to present at and attend international conferences in their fields. These postgraduates will also be prioritized for attending short-term clinical training opportunities, when needed, in select East African Centers of Excellence.

3. Subspecialty training of new and junior faculty

New subspecialist faculty members are urgently needed in Rwanda. In the world today, specialists are not trained by other specialists, but by subspecialists (for example, a cardiology rotation in internal medicine is not taught by a general internist, but by a cardiologist).[11] While these rotations will be supported by US subspecialists through the HRH Program, Rwandan subspecialist faculty must be developed to replace them in the transition. For those postgraduate students identified as potential faculty members in subspecialties, an accelerated schedule will be established, as is common in Europe. Postgraduate training would be shortened from four to three years, with the 4th year used for clinical training in a specific subspecialty either in Rwanda or abroad, depending upon training capacity. These new subspecialist faculty members, while providing care to patients in their own subspecialties, would then teach specific components in the postgraduate specialty programs.

It will take several years even for the accelerated system to produce sufficient faculty in the sub-specialties, yet upcoming postgraduates urgently need this training to become competent specialists. A stopgap measure will thus be needed to staff the subspecialty rotations in the interim. Exceptional junior faculty, currently practicing as specialists, will be targeted for immediate, short-term subspecialty training of 1-2 years. These subspecialty programs do not currently exist in Rwanda, so candidates will need to go abroad for training, likely in South Africa. While these short-term training courses will not produce full subspecialists, they do effectively prepare faculty who are already competent clinically but require further academic training.

The presence of US subspecialists and specialists in the postgraduate programs will make this increasing specialization possible, by filling gaps where faculty are removed to pursue further specialization, and providing the quality teaching that will be necessary to produce new specialty and subspecialty faculty. The US faculty will also mentor the newly trained subspecialists returning to Rwanda. By the end of 7 years, however, enough Rwandan specialty and subspecialty faculty will exist to train Rwandan generalists and specialists. While some subspecialists will still require international training, it will be increasingly possible to train many subspecialists in Rwanda.

The design of the faculty training program will require intensive coordination and a high level of expertise in curriculum development and medical education. A tentative list of prioritized subspecialties and candidate cadres has been proposed by the Faculty of Medicine and the teaching hospitals for budgetary purposes, as detailed in Table 76. A detailed plan for subspecialty faculty targets, training, and deployment will therefore be developed in the workshop described above and during the Planning Phase of the HRH Project.

[11] Specialists in Rwanda would often be considered generalists in the US system, such as internists. Subspecialists as defined in Rwanda, such as cardiologists, would often be considered specialists in the US. Rwandan terminology is used here for consistency.

Table 76. Priority Subspecialty Training Abroad by Current Level of Physician Training

Specialty	GPs	Postgraduates	Junior clinical mentors
Allergology	-	1	-
Cardiology	-	2	-
Cardio thoracic surgery	-	-	1
Dermatology	2	-	-
Endocrynology	-	2	-
Gastroenterology	-	1	-
Hematology (clinical)	-	2	-
Hepatology	-	1	-
Immunology	-	-	1
Microbiology	-	1	-
Neonatology	-	-	1
Nephrology	-	2	-
Neurology	-	2	-
Neurosurgery	-	-	1
Oncology	-	-	1
Opthamology	1	-	-
Oral and maxillofacial surgery	-	-	1
Orthopedic surgery	-	3	1
Pediatric surgery	-	3	-
Plastic surgery	-	-	1
Pulmonology	-	-	-
Rheumatology	-	-	1
Thoracic surgery	-	-	1
Urology	-	1	1
Vascular surgery	-	-	1
TOTAL	**3**	**21**	**12**

VIII. Summary

Through the HRH Program, physician workforce targets will be met by producing a highly skilled cohort of new graduates. The program will focus specifically on producing physicians in six critical specialties: internal medicine, pediatrics, obstetrics/gynecology, surgery, anesthesiology, and family medicine. Additional specialties, including emergency medicine, will also be targeted with investments and US faculty support through the HRH Program. These specialty programs will be strengthened and further developed: curricula will be revised, clinical training sites will be upgraded, and Rwandan faculty will be mentored and supplemented by US. Between 2012 and 2019, 549 new physicians will be produced through the HRH Program, reaching a total of 1,182 Rwandan physicians (Table 77). Importantly, the skill mix of the medical field in Rwanda will shift dramatically toward highly skilled specialists, increasing the number of this cadre by 401 to a total of 551 specialists and subspecialists.[12] Many of these new physicians will be recruited to serve as faculty and provided sufficient training and mentorship to ensure a high quality medical education system into the future.

Table 77. Workforce Targets, by Specialty, 2012-2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 19)
General Practitioners	470	483	502	522	551	569	590	611	631	148
Anesthesiology	8	11	16	16	19	24	29	34	39	28
FAMCO	0	0	7	7	12	21	37	53	69	69
Surgery	6	14	23	23	27	36	48	60	72	58
OB/Gyn	19	21	31	31	38	50	62	74	86	65
Pediatrics	14	15	24	24	30	38	51	64	77	62
Internal Medicine	12	15	22	22	29	38	52	66	80	65
Emergency Medicine	0	0	0	0	0	0	0	3	6	6
Oncology	0	0	0	0	0	0	3	6	9	9
Neurology	2	2	2	2	2	2	2	5	8	6
Orthopedics	7	7	7	7	7	7	7	10	13	6
Psychiatry	3	3	3	3	3	3	6	9	12	9
Radiology	5	5	5	5	5	5	5	8	11	6
ENT	0	0	0	0	0	0	0	3	6	6
Pathology	0	0	0	0	0	0	0	3	6	6
Other	57	57	57	57	57	57	57	57	57	0
Specialist Total	**133**	**150**	**197**	**197**	**229**	**281**	**359**	**455**	**551**	**401**
PHYSICIAN TOTAL	**603**	**633**	**699**	**719**	**780**	**850**	**949**	**1066**	**1182**	**549**

[12] The 57 specialists in the table below listed as "Other" includes specialties and subspecialties that are excluded from the targeted specialties for the HRH Program. These physicians were trained abroad, due to a lack of training capacity in Rwanda. This number will not increase during the HRH Program.

Nursing and Midwifery

Appendix 6

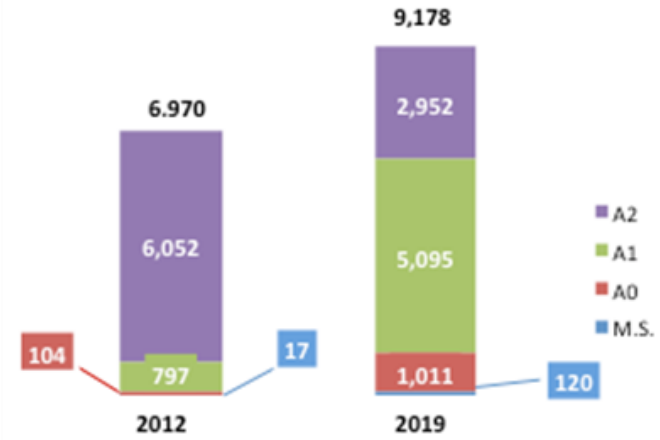
Appendix 6. Nursing and Midwifery

This appendix details the scale-up plan for the nursing and midwifery programs included in the HRH Program. It explains the current state of nursing education in Rwanda and the gaps that need to be addressed in order to improve it; the targets for the nursing workforce and the students that will ultimately compose that workforce; the curriculum that will be used to train these students; and the faculty requirements to run the program.

I. Overview of Strategy

The number of qualified nurses and midwives will increase significantly through an enrollment scale-up at the five A1 Schools of Nursing and Midwifery and the Faculty of Nursing Sciences. The program will train nurses with higher qualifications, with an emphasis on upgrading A2 nurses to the A1 level and providing more opportunities for nursing education at both the A0 (Bachelor) level and the Master's level. Between 2012 and 2019, the total number of nurses will increase from 6,970 to 9,178. Just as importantly, more than 3,000 A2 nurses will have been upgraded to the A1 level and the number of A0 nurses will have increased more than 10-fold. A critical cadre of nurses and midwives will complete a Master's degree, increasing this cohort from only 17 to 120. See Figure 1 below for increases in the Master's, A0, A1 and A2 levels in 2011 compared to the end of the HRH Program at the end of the 2018 academic year.

Figure 9. Nursing Workforce Targets in the HRH Program, 2011-2018[13]



The nursing workforce targets were set by the MOH to rapidly meet Rwanda's nursing needs while ensuring quality and sustainability. The workforce targets, and the corresponding enrollment and faculty targets detailed in this appendix, were modeled according to several criteria:

1) Reference to the nursing targets that the Ministry of Health defined in the HRH Strategic Plan, 2012-2016. Over the course of 7 years, the Ministry of Health set the goal of increasing the number of nurses to 10,171.

[13] A0, A1, and A2 2011 #s based on document *HRH Strategic Plan: 2011 - 2016* and projected 2011 graduates; MS-level 2012 # based on conversations with FNS staff and projected 2011 graduates.

2) Consider the number of faculty commitments from US schools available to mentor educators and students.

3) Consider capacity of training sites to support students and educators.

4) Take into account the strategies outlined in the concept notes that Rwandan faculty and their US counterparts created at the Academic Consortium meeting in May 2011.

The rapid upgrading of thousands of nurses from A2 to A1 requires a very different model than the other cadres in the HRH Program. These are existing health workers who are required to upgrade their skills rapidly, and schools are expected to make this possible without a significant increase in faculty. The strategy proposed here reflects this unique situation, emphasizing the training of existing educators and introducing novel programs, such as e-learning, to allow for the continuing education of practicing professionals.

A. Current State of Nursing Education

Nursing and midwifery education in Rwanda has been dramatically reformed in recent years. In the past, all nurses were trained at the A2 level, meaning they had a secondary school diploma. Many types of schools prepared young people to serve as nurses, including faith-based, private, and government schools. Unlike nursing education in surrounding countries, there was no educational ladder to professional nursing. In 2007, the government of Rwanda discontinued A2 nursing education and issued a requirement that all nurses working in Rwanda be educated to at least the A1 level (A2 plus 3 years of higher education). It also reduced the number of schools that were training A1 nursing students to five: Byumba, Kabgayi, Kibungo, Nyagatare and Rwamagana. This was done in an effort to improve the quality of nursing education and standardize graduation requirements. Plans were put in place to upgrade all A2 nurses to A1 level. The Government of Rwanda approved a new nursing curriculum to include core competencies and specific benchmarks for graduation.

The training of more highly qualified nurses and nursing faculty has undergone a similar transformation. Before 2006, the Faculty of Nursing Sciences (FNS) at the Kigali Health Institute (KHI) educated nursing students to the A1 level). In 2006, the FNS began educating nurses at the bachelor's level, creating the first cadre of A0 nurses. In an effort to produce nursing and midwifery faculty, KHI developed a Bachelor of Nursing Education program in 2007 and graduated 32 students in 2009. Another 23 will graduate at the end of 2011. There still remains a large gap between the number of nursing and midwifery faculty needed and the number available. In 2011, the School of Nursing and the School of Midwifery will become part of the Rwanda University of Medical and Health Sciences (RUMHS). It will no longer issue any diploma below a bachelor's degree; though it will begin developing certificate and master's programs as the Nursing and Midwifery Department of the Ministry of Health and the Nursing and Midwifery Council[14] identify the specific need for specialization in nursing practice. KHI, which was previously the responsibility of the Ministry of

[14] The National Council of Nurses and Midwives was established in July 2008. It is responsible for the regulation of nursing and midwifery practice, registration, curriculum approval, and ensuring the quality of nursing and midwifery education and practice. The Council has worked hard to put policies in place, but has faced tremendous challenges in meeting all of its responsibilities.

Education, was put under the supervision of the Ministry of Health in 2010. All nursing and midwifery education is now the responsibility of the Ministry of Health.

Despite these improvements, at all of the schools of nursing and midwifery, there is general agreement that the quality of clinical instruction is inadequate. Although all clinical instructors meet the required A1 qualification, many are recent graduates who have no prior teaching or clinical experience. Since professional midwifery is so new to Rwanda, very few midwifery lecturers are present in-country. Additionally, though the Faculty of Nursing Sciences and the five A1 Schools of Nursing and Midwifery depend on staff nurses in the teaching hospitals to mentor students on-site, this rarely happens. Many of the staff nurses often do not see teaching as part of their responsibility, or are at the A2 level and not qualified to teach A1 or A0 students. As a result, students often go unsupervised at the teaching sites.

B. Needs and Gaps

1. Workforce Targets

Based on these enrollment and skill upgrade targets, the HRH Program aims to produce a total of 9,462 nurses and midwives by 2019. This workforce will reflect a skill level and distribution appropriate for the Rwandan population.

Table 78. Workforce Targets for Nursing Programs, 2012-2019

	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 – 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
Master's-level nurses	17	17	25	38	51	64	92	120	103
A0 nurses	102	138	190	329	499	669	839	1,009	907
A1 nurses	797	1,076	1,330	1,985	2,740	3,545	4,350	5,095	4,298
A2 nurses	6,052	5,902	5,702	5,152	4,602	4,052	3,502	2,952	-3,100
NURSING TOTAL	**6,968**	**7,133**	**7,247**	**7,504**	**7,892**	**8,330**	**8,783**	**9,176**	**2,208**

2. Infrastructure and Equipment

In contrast to challenges faced by physician specialties, nursing and midwifery education faces a problem primarily with the quality of current clinical training sites, rather than the quantity. To improve the quality of education provided to nurses and midwives, the HRH Program will provide substantial upgrades to infrastructure and equipment at 12 clinical training sites. In addition, the five A1 Schools of Nursing and Midwifery will be upgraded. The Faculty of Nursing Sciences will also undergo upgrades to infrastructure and equipment.

3. Student Targets

In order to produce enough new graduates to achieve these targets by 2018, the five A1 Schools of Nursing and Midwifery and FNS must scale up their enrollment significantly. The five Schools of Nursing and Midwifery will increase their total enrollment rate to 825 new students per year by 2014, after which point intake will remain constant. New admissions will include all three types of students for both general nursing and midwifery: direct-entry, regular upgrade, and e-learning. While there will be some increase in the number of enrollees directly from secondary school, the bulk of the scale-up will concern A2 upgrades both via the regular, 2-year upgrade program and the new, 3-year e-learning program.

FNS will also need to expand its enrollment somewhat in order to meet the target for new A0 nurses and midwives, as well as nurse mentors and educators. This will be achieved in part by creating new programs in addition to those already in operation, including a Master's in Nursing Sciences program, specialty nursing certificate/diploma programs, and bridging programs that allow A1 nurses to upgrade their skills to level A0 in both general nursing and midwifery. Current programs will be strengthened and scaled up. Enrollment for both existing and new A0 programs will increase.

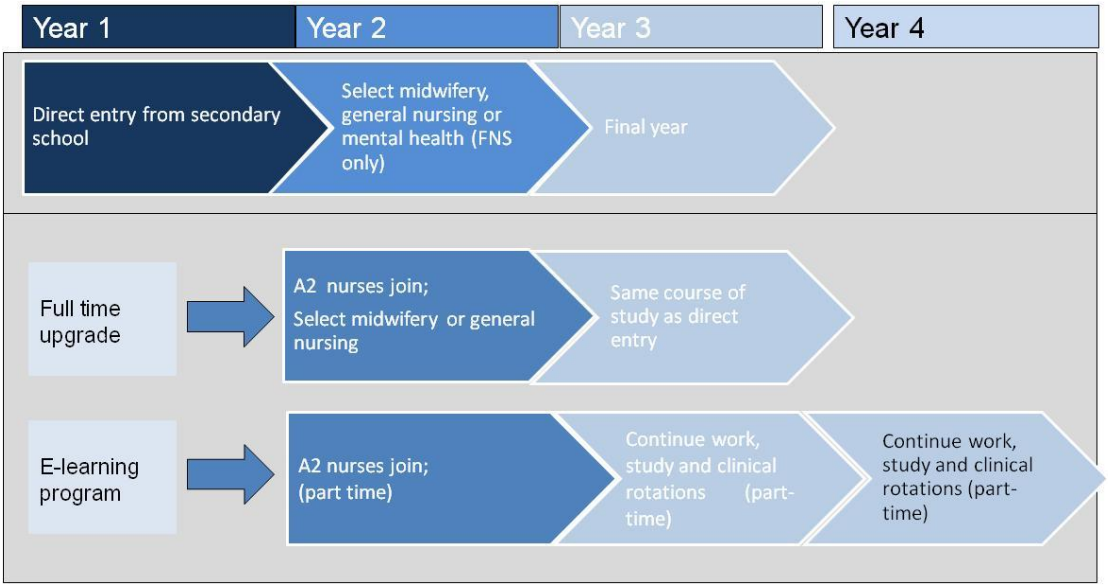
Table 2. First-Year Enrollment Targets at the Faculty of Nursing Sciences, 2012 – 2019

Program	Program Type	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
General Nursing (A0)	*Existing*	35	35	35	35	35	35	35
Midwifery (A0)	*New*	30	30	30	30	30	30	30
General Nursing Bridging Program (A1 --> A0)	*New*	30	30	30	30	30	30	30
Midwifery Bridging Program (A1 --> A0)	*New*	50	50	50	50	50	50	50
Bachelor in Nursing Education (A0)	*Existing*	25	25	25	25	25	25	25
Critical Care Nursing Master's Program	*Existing*	8	8	8	8	8	8	8
Master's in Nursing Program (MSN)	*New*	0	0	0	20	20	20	20
TOTAL INTAKE		**178**	**178**	**178**	**198**	**198**	**198**	**198**

C. Curriculum

The nursing schools enroll two types of students: direct-entry students who matriculate directly after secondary school, and upgrade students who are former A2 nurses upgrading to A1 level. Upgrade students bypass the first year of study and graduate after only two years. Approximately 750 students are currently enrolled in Rwanda's five nursing schools, with roughly 150 students at each. The Faculty of Nursing Sciences currently contributes 258 A1 nursing students to the enrollment total through its remaining A1 programs in general nursing, midwifery, and mental health, but these programs will be phased out.

Figure 10. Paths to A1 education



The educational program for A1 nurses is a 3-year program. It includes both classroom-based lecturing and onsite clinical mentoring at district hospitals and health centers. While the first year is primarily classroom-based, the second and third years focus increasingly on direct clinical experience. There is no specialization in the first year, but students select between General Nursing and Midwifery for their second and third years. Midwifery students currently account for 30-50% of total enrollment and require specialized mentors for clinical visits. The Ministry of Health is encouraging more students to choose the nurse-midwifery track. For this reason, students in the full-time upgrade program from A2 to A1 are mostly on the midwifery track.

Beginning in 2011, the nursing schools will implement a distance or "e-learning" program for A2 nurses upgrading to A1 on the general nursing track. The program will take place at all five schools, as well is Rwinkwavu and Butaro District Hospitals. Students in this program will receive most of the content and materials online, along with some in-person instruction. This includes tutoring at a distance, in-person tutoring at the nursing schools, workplace mentoring, counseling, and peer-to-peer support structures. The blend of in-person instruction and online content delivery will reduce some of the burden at the nursing schools themselves, but there will still be costs in human resources, equipment, and infrastructure. IT equipment will need to be scaled up significantly. The e-learning program will allow the nursing schools to absorb more A2 nurses each year than could be accommodated with classroom learning alone.

The Faculty of Nursing Sciences will also develop post baccalaureate certificate/diploma programs in specialty areas. Several nursing specialties have been suggested by the Department of Nursing in the Ministry of Health and by FNS faculty, including surgical nursing, pediatrics and mental health. It is uncertain at this time which specialty will be dedicated as the priority. FNS will work with the Nursing and Midwifery Council to prioritize specialty training, set standards for certification and forecast the need for nurses with specific clinical knowledge and skills. These specialty programs will be phased- in beginning in 2013.

Table 3. Projected student intake in Faculty of Nursing Sciences certificate programs, 2012 - 2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Specialty Nursing Certificate/ Diploma Programs	0	0	0	30	60	90	90

D. Faculty Requirements and US Academic Consortium Involvement

The focus on increasing the skill levels of Rwandan nurses makes increasing the quality and qualifications of faculty essential. There are two types of teaching faculty employed by FNS and the schools of nursing and midwifery: nurse lecturers and clinical instructors. Nurse lecturers must meet the higher A0 (bachelor level) degree and teach through classroom lectures. Lecturers often provide significant clinical instruction as well. Clinical instructors, prepared at the A1 or A0 level accompany students to clinical sites to supervise and evaluate them. They also teach in the skills labs at the schools. Rwandan nursing and midwifery educators have determined that the ideal model for clinical instruction is one in which most of the hands-on practical teaching would be done by nurses and midwives employed by the hospitals. These nurses/midwives would receive training in clinical mentoring skills and be required to mentor nursing and midwifery students as part of their regular duties. All clinical mentors and clinical instructors should be educated at the A1 or A0 level. Faculty at the schools will remain responsible for supervision and evaluation of students. To reach the

workforce goals and student enrollment targets mentioned above, intensive investments will be made in improving the quality and quantity of nursing and midwifery faculty and mentors.

1. Strengthening Nursing and Midwifery Faculty

Through the HRH Program the Bachelors in Nursing Education (BNE) program at the Faculty of Nursing Sciences will graduate a class of 25 new faculty per year beginning in 2014, accumulating a total of 170 nurse lecturers from the BNE program by 2019.

Table 79. Graduation Targets for Bachelors in Nursing Education Program, 2012-2019

	Current	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Graduating Class Size	n/a	0	25	0	15	25	25	25	25
Cumulative BNE Graduates	32	32	57	57	72	97	122	147	172

To create and sustain a highly qualified nursing education workforce, an in-country Master of Science in Nursing (MSN) program will be developed over the course of the program. 5 Rwandan A0 nurses per year will be given the opportunity to attain a master's degree through study in another African country or through distance learning provided by a US institution during years 1, 2 and 3 (2012 – 2014). When these students return, they will become full-time lecturers (see Table 79). US faculty will partner with KHI faculty to develop the in-country capacity for an MSN program by year 4 (2015). From 2016 - 2018, scholarship funds will be provided for 20 students per year to receive their MSN within Rwanda, producing the first Rwandan generation of highly-qualified Nurse Educators. The total number of students completing an MSN through both overseas and in-country programs will be 55.

2. Increasing and Strengthening Mentorship

A four-week certificate program for clinical mentorship will be launched to improve the quality of clinical training for nursing and midwifery education. The program will begin with 2 weeks of classroom-based lectures on clinical instruction, followed by 2 weeks of practical instruction led by a US and Rwandan mentor pair. After completing this course, A1 and A0 nurses working at clinical teaching facilities will begin teaching and mentoring students during clinical rotations. We estimate that 20% of each mentor's work day will be spent mentoring.

The Table 80 shows the production of Rwandan mentors through the HRH Program. In addition to the 240 clinical mentors (totaling 48 FTEs, assuming each mentor spends 20% of total work time on mentoring after the program) who will be educated through this certificate program, 50 current nursing or midwifery faculty clinical instructors will enroll as well. The total number of nurses and midwives trained in clinical mentorship will reach 290 throughout the course of the program.

Table 80. Nursing and Midwifery Clinical Mentors Trained, 2012-2019

	2011	2012	2013	2014	2015	2016	2017	2018
Annual Class Size	0	40	40	40	40	40	40	0
Total Rwandan Mentors	0	40	80	120	160	200	240	240

Fifty existing clinical instructors employed by the schools of nursing and midwifery or the FNS will also complete this course, leading to significant improvement in their ability to provide high quality clinical instruction, supervision and evaluation of students.

3. Support Staff

Although the greatest HR need is for teaching faculty, the Rwandan Government will add support staff as well. 1 administrative assistant will be recruited for each nursing and midwifery school (including the Faculty of Nursing Sciences). The administrative support staff will continue beyond 2019, absorbed by the Ministry of Health following the project's completion.

4. Engagement of the US Academic Consortium

Faculty from US Academic Institutions will play a substantial role in the Nursing and Midwifery scale-up. A total of 42 faculty will be deployed in year one, with support roles ranging from national level program development to on-site clinical mentoring. The sum of these commitments is described in Table 81, and then detailed below.

Table 81. US Faculty from Academic Consortium, Academic Years 2012 – 2018

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
National-Level Nursing Support	4	4	4	3	2	1	0
A0 & Master's-Level Nursing Education	1	1	1	1	1	1	1
A1 Nursing & Midwifery Education	5	5	5	5	5	5	5
Clinical Nursing Mentorship	32	32	30	23	20	16	11
GRAND TOTAL: Nursing & Midwifery	**42**	**42**	**40**	**32**	**28**	**23**	**17**

5. National Level Support for Nursing Education

The US nursing schools will recruit nurses to serve in a number of positions that will strengthen nursing practice on a national level. These will include:

- 1 faculty member with regulatory experience to work with the National Department of Nursing and Midwifery and the National Council of Nurses and Midwives to assist with the development of national policy (e.g., licensure, accreditation, curriculum approval, certification in specialty areas, continuing education requirements).
- 1 faculty member with simulation/skills lab expertise to advise FNS and the 5 schools of nursing and midwifery on the most effective way to integrate skills lab sessions into the existing curriculum. This person will advise on appropriate equipment to be purchased. He/she will also train simulation experts at KHI and the 5 schools.
- 1 faculty member with distance learning expertise to advise all schools and the National Department of Nursing and Midwifery on the effective use of e-learning in all programs. He/she will assist with the creation of educational modules, train

faculty to optimize the effectiveness of e-learning materials, and assist with integration of e-learning into all future nursing education curricula.

- 1 faculty member with curriculum expertise to advise on curriculum development and revision both at FNS and at the national level, including any new programs developed at KHI. He/she will also advise on the creation of bridging programs from A1 to A0.

6. Support for A0 and Masters Nursing and Midwifery Education

- 1 nurse educator devoted entirely to FNS with expertise in developing new programs, faculty development, and research. He/she will partner with the Dean at KHI.

7. Support for A1 Nursing and Midwifery Education

- One US nurse educator will be placed at each of the schools of nursing to partner with the director of the school. He/she will work with the existing faculty to improve teaching techniques, integrate simulation into the curriculum, and address all other aspects of the functioning of the school.

E. Clinical training enhancement

A total of 32 clinical mentors will be recruited from US academic institutions and assigned to teaching facilities throughout the country. Nurses and midwives with experience in specific specialty areas will be placed in facilities where they will have the opportunity to teach the maximum number of Rwandan nursing and midwifery students, from both FNS and the 5 Schools of Nursing and Midwifery. These mentors will also serve as part of the professional development team at the teaching hospitals, and provide continuing education to the existing nursing and midwifery staff. They will work closely with the physician mentors to foster integrated education of medical, nursing and midwifery students and medical residents. This interdisciplinary team will, in collaboration with facility leadership, develop quality improvement plans. Each mentor will also serve as a resource for KHI and the 5 schools, providing lectures, faculty development programs, and advice on curriculum development in his or her specialty area. Out of these 32 mentors, they will cover the following areas:

The 9 adult clinical mentors will include:

- 5 generalists to be placed at the referral and provincial hospitals
- 2 critical care nurses to be placed at the referral hospitals where most students get their training, probably moving on to other ICU facilities as the year progresses
- 1 trauma/surgery nurse to be based at the most appropriate referral hospital, then rotating through other facilities
- 1 infection control nurse who will be a shared resource and develop a training course for infection control nurses

The 8 pediatric mentors will include:

- 2 neonatal nurses to be placed at the sites where most students do their neonatal ICU rotation, and rotate through the other facilities
- 5 generalists to be placed at the referral and provincial hospitals

- 1 pediatric/adolescent mental health nurse – placed in the referral hospital where most students do their pediatric rotation, then a shared resource to all schools and teaching sites

The 8 midwifery mentors:

- Placed at the referral and provincial hospitals
- Placed at other facilities that provide midwifery clinical instruction, including reproductive health, family planning, antenatal care, postpartum care and services related to Prevention of Mother to Child Transmission (PMTCT) of HIV.

The 5 District Health nurse mentors will be placed as follows:

- One US clinical mentor will be placed at the district hospital attached to each school of nursing and midwifery. He/she will work with the clinical instructors at the school of nursing and midwifery to conduct bedside teaching for nursing students and provide continuing professional development for the existing nursing and midwifery staff. These instructors will also be available to lecture at the school of nursing and midwifery. As the program progresses, US and Rwandan faculty will strengthen clinical instruction and professional development at the surrounding health centers as well.

The 2 mental health nurses include:

- 1 to be a full-time mentor at Ndera hospital
- 1 to be a shared resource for all schools and facilities
- These mentors will each be paired with a Rwandan mental health nurse.

The summary of the US nursing educators and clinical mentors by deployment site and year is provided in Table 82 below.

Table 82. US Nursing and Midwifery Faculty by Deployment Site, 2012 - 2018

Program	Location	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
National-Level Nursing Support	Faculty of Nursing Sciences	4	4	4	3	2	1	0
A0 & Master's-Level Nursing Education	Faculty of Nursing Sciences	1	1	1	1	1	1	1
A1 Nursing & Midwifery Education	Byumba (SON)	1	1	1	1	1	1	1
	Kabgayi (SON)	1	1	1	1	1	1	1
	Kibungo (SON)	1	1	1	1	1	1	1
	Nyagatare (SON)	1	1	1	1	1	1	1
	Rwamagana (SON)	1	1	1	1	1	1	1
LECTURER SUBTOTAL		**10**	**10**	**10**	**9**	**8**	**7**	**6**
Clinical Nursing Mentorship	Byumba (DH)	2	2	2	1	1	1	1
	CHUB (RH)	4	4	3	3	2	1	1
	CHUK (RH)	6	6	6	6	6	6	5
	Kabgayi (PH)	3	3	3	3	3	1	0
	KFH (RH)	4	4	3	3	3	3	1
	Faculty of Nursing Sciences	1	1	1	1	1	1	1
	Kibungo (DH)	2	2	2	1	1	1	0
	Ndera (DH)	1	1	1	1	1	1	1
	Nyagatare (DH)	2	2	2	1	1	1	1
	Rwamagana (PH)	3	3	3	2	0	0	0
	Rwinkwavu (DH)	2	2	2	1	1	0	0
	Butaro (DH)	2	2	2	0	0	0	0
MENTOR SUBTOTAL		**32**	**32**	**30**	**23**	**20**	**16**	**11**
GRAND TOTAL: Nursing & Midwifery		**42**	**42**	**40**	**32**	**28**	**23**	**17**

Health Management

Appendix 7

Appendix 7. Health Management

Strengthening health facility performance provides the foundation for the delivery of effective healthcare. Currently the focus of human resources development in healthcare tends to be on clinicians such as doctors and nurses. Yet hospitals and health centers are complex institutions that require strong management in much the same way as any other organization with large operating budgets and multiple departments with significant infrastructure and human resources requirements. Effective management of these institutions is essential to the functionality of both facilities and staff, and is therefore a crucial determinant of quality of care. This is especially true in Rwanda, a country characterized by rapid change, progressive and innovative policy reform and ambitious goals. Managers are required to translate policy into practice in order for these ambitions to bear fruit. Further, given the severe human resource shortages and other resource constraints in Rwanda, effective management is even more critical to ensure effective use of limited resources.

I. Current situation

Several analyses of hospital and health center management, as well as anecdotal evidence from the field, show strongly that management systems are weak at all levels of care, from health centers to referral hospitals. This is in large part because the proper functioning of a health system requires managers with training in management, as opposed to the senior clinicians currently managing the majority of Rwanda's health facilities. Effective management is lacking at each of the 3 referral hospitals, 41 district hospitals (including Kacyiru Police Hospital and Kanombe Military Hospital) and 425 health centers in Rwanda. Additionally each of Rwanda's 30 district health systems is managed by a team led by a District Health Director, only 7 of which have any management or public health training.[15]

Established in 2001, the School of Public Health of the National University of Rwanda (soon to be part of the Rwanda University of Medicine and Health Sciences, RUMHS) has utilized regional and global partnerships to develop a series of academic programs, including certificate, diploma, and masters-level educational programsfellowships, and a series of Continuing Education Programs.

II. Needs and Gaps

A. Workforce Targets

The training opportunities for health care management are minimal in Rwanda, and health management is not a well-developed profession in the country or the region. Therefore, significant support is needed to build an educational pipeline for health managers, graduating enough students to serve all of the district hospitals (41) and district health offices (30) in Rwanda and ensuring strong ongoing support and mentoring until a critical mass of health management professionals can be developed. To staff these positions, 75 new masters-level management professionals will be added to the workforce by 2018 (Table 83).

Table 83. Health Management Workforce Targets 2011-2019

[15] DHSST, 2010.

Program	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
CIHM	0	0	0	0	15	30	45	60	75	75
MHA	7	7	7	7	22	37	52	67	82	75
Total	**7**	**7**	**7**	**7**	**37**	**67**	**97**	**127**	**157**	**150**

In addition to the chief health managers at hospitals and district health offices, there is also a need to build management capacity in their teams. Members of these management teams, including administrators, heads of clinical departments, and chief nursing officers at the hospital level and officers-in-charge and their teams in the district offices are tasked with managing complex healthcare delivery systems but have not been trained in basic health management skills and tools. The needs of this group of individuals will also need to be met through a certificate-level training program. A cadre of 75 certified managers will be produced by 2019 (Table 83).

Finally, there is a lack of basic management training incorporated into the pre-service training of doctors, nurses, and other allied healthcare professionals. Education in health management topics, including scientific problem solving, leadership, financial and human resource management, and, importantly, principles of quality improvement would ensure that all healthcare professionals are prepared to support a high functioning healthcare delivery system.

B. Infrastructure and Equipment

To accommodate the increased number of students, the School of Public Health will require some investment in additional educational space and equipment. These include additional classroom and conference space, and basic teaching equipment such as computers, books, journal subscriptions, and projectors.

C. Student Targets

In order to produce sufficient qualified managers for all of the district hospitals and district health offices in Rwanda, the program must enroll 17 students per year (Table 84).

Table 84. Health Management Enrollment Targets 2011 - 2018

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
CIHM	17	17	17	17	17	17	17
MHA	17	17	17	17	17	17	17
TOTAL INTAKE	**34**	**34**	**34**	**34**	**34**	**34**	**34**

Over seven years an annual intake of 34 students would allow for the training of all 41 medical directors, 30 District Health Directors and nearly all 41 hospital administrators (as seen above in Table 83)

D. Curriculum

With the support of Yale University, the School of Public Health has developed a curriculum for a Masters in Hospital and Health Care Administration (MHA). This health management degree will require 2-years of full-time executive-style study. The curriculum is modeled after similar initiatives

that have successfully educated health managers in Ethiopia, Liberia, South Africa, China and the UK. Drawing on prior experience, Yale has reviewed and revised the curriculum to reflect lessons learnt. The sub-masters certificate program and undergraduate module program are being developed.

The objectives of the MHA and sub-masters programs are to:

- Effectively and efficiently develop the management capacity at the referral, provincial, and district hospital level, and in the district health management team;
- Catalyze tangible improvements in key management systems and among the hospital and district management teams;
- Develop tools and mechanisms for quality improvement and system strengthening that can be used nationally to improve delivery of care;
- Support the School of Public Health in the development of an educational and training program and skilled program faculty to ensure a sustainable pipeline of skilled healthcare managers.

The health management program will also promote the development of a *Chief Operating Officer for hospital management,* to transition over time to a CEO model for hospital leadership. Once candidates for this new position are identified, they must be supported through the development of an executive-style training program that is tailored to meet their needs. The final step in this multi-pronged approach is to build capacity at the School of Public Health to offer a two-year, executive-style *Master in Hospital and Healthcare Administration (MHA)* program that combines classroom-based work in management and leadership, with supported field-based work to apply and refine these skills. In the early stages of the MHA program, to maximize impact of the cohorts of trainees and to position them to implement their new skills in transforming health policy reform into practice, we believe that there should be a targeted role in the hospitals or district health offices for these trainees upon graduation.

With assistance from the US mentors, the School of Public Health will develop and offer a *Certificate of International Health Management (CIHM)*. This academic certificate (60 credits/600 hours) would consist of 25% in-class training offered over four 1-week blocks, combined with 75% mentored executive practice. Didactic training would cover key management principles such as strategic problem solving, leadership and change management, human resource management, financial management, operations and quality improvement. We recommend that teams attend from each hospital (for example, the Director General, Director of Nursing, and Administrator) so that the executive practice can take the form of an interdisciplinary improvement initiative. We anticipate that approximately 50-60 students (15 hospital teams) would enroll in each cohort. In addition, a retroactive training option will be provided for non-degree holders (since A2 nurses do not have bachelor's degrees). This qualification will target managers of health centers.

Finally, the management program will utilize an *applied mentoring model* to build management and leadership capacity at the hospital and district level. Mentors will coach hospital administrators and district health units to apply their classroom learning to practical management system projects in their place of work. This partnership between mentors and management staff in the health facilities is critical and the relationships grow very strong over time, with demonstrated impact on individual management and leadership capacity, organizational culture, and hospital operations.

It is anticipated that students will spend 25% of their time (for either the MHA or CIHM) in the classroom and the remaining 75% of the time in their work setting for on-the-job mentorship. The

MHA will be hosted by the SPH Department of Health Policy, Economics and Management. An MHA curriculum has already been developed jointly by the SPH and Yale. The CIHM curriculum, also jointly being developed by the SPH and Yale is near completion. The basic management principles need to be taught to undergraduate doctors and nurses in interdisciplinary teams to inculcate an appreciation for management at the hospital levels.

The following are focus areas for management training to be integrated into training for other health cadres:

- Strategic planning
- Scientific problem solving
- Human resource planning and management
- Financial management
- Inventory control and pharmacy management
- Patient flow
- Medical records
- Infection control
- Supply chain
- Laboratory management
- Facilities and materials management
- Performance assessments / quality improvement
- Leadership
- Project management
- Relationship management and communication
- Governance

To provide ongoing support to graduates, the Program Director at the SPH will make it a key part of their objectives in the first years of the program to assist in the creation of an association of graduates of the program (Association of Health Care Executives). This will serve as a networking and cross-learning forum for managers in the health care system.

E. Faculty Requirements and US Academic Consortium Involvement

Many of the modules in the MHA and CIHM programs can be taught by existing faculty at the School of Public Health. The School of Public Health has identified that they require only two new full-time Rwandan faculty members, and only a limited number of expatriate faculty, for classroom teaching. However, there are very few qualified health managers currently in Rwanda to provide mentorship. Therefore, for the first 3 years of the HRH Program, this gap will be filled by experienced US hospital and healthcare administrators with demonstrated experience and success in hospital and/or health care administration and mentoring. An effort will be made, starting in the second year of the program by the Program Coordinator, to identify strong existing managers in the health care system to take mentorship roles, such as MHA program graduates. In total, an estimated 6 full-time equivalent (FTE) US faculty will be needed, combining classroom teaching with hands-on mentoring.

Table 85. Health Management US Faculty Requirements, 2012-2019

2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
6	6	4	0	0	0	0

Additionally other faculty will also rotate through Rwanda from the U.S. to teach specific specialty topics. The profile of the expatriate faculty/mentors required will need to be defined by the School of Public Health and participating schools.

Oral Health

Appendix 8

Appendix 8. Oral Health

I. Current situation

There are approximately 122 oral healthcare providers in Rwanda, a country of about 10 million people. Of the few dental surgeons[16] (23) practicing in the country, only 10 are of Rwandan origin. There are 105 dental therapists. Currently, Rwanda does not have a comprehensive oral health professional school, and trains only dental therapists. All dental surgeons practicing in country have obtained their degrees outside Rwanda. The Kigali Health Institute offers a Bachelor of Dental Therapy program and graduates an annual class of about 27 therapists. Currently, therapists are trained to provide basic, non-invasive restorative and periodontal procedures and simple extractions. This Bachelor of Dental Therapy program alone will not suffice to address the shortages described above because of the therapists' limited scope of practice and their small numbers. It is therefore critical that Rwanda establish the School of Dentistry to produce a core of dental health professionals with diverse levels of clinical skills and teaching capacity.

Oral Health is commonly overlooked in comprehensive care plans by mainstream health care providers and the community. Despite the changing oral disease patterns and needs, a severe shortage of adequately trained oral health personnel exists. The School of Dentistry will promote a better understanding of oral and systemic health connections among health care professionals and the community. Greater appreciation of these connections will help identify and reduce risk factors associated with communicable and non communicable diseases such as HIV/AIDS, malnutrition, diabetes, hypertension, and factors complicating neonatal development.

II. Needs and Gaps

A. Workforce Targets

According to the World Health Organization, there is a high discrepancy in the relative number of oral healthcare providers in industrial and low-resource nations. The former contain one provider per 2,000 citizens while the latter have only one provider per 160,000 citizens.[17] However, the average ratio of GOR-employed oral healthcare providers is 1:109,000[18], somewhat exceeding low-resource nations' average and poising the country to further narrow gap.

Experts from the US Academic Consortium indicate that the following oral health providers are required per facility.

[16] Dentists, those with DDS degrees by US standards, are considered dental surgeons in Rwanda
[17] http://www.who.int/oral_health/action/services/en/index.html
[18] DHSST 2009

Table 86. Oral Health Providers Required per Facility

Provider	Facility Type	Quantity
Dental Assistant	Health Center	1
Dental Therapist	Health Center	1
Dental Surgeon	District Hospital	1
Lab Technician	Provincial Hospital	1
Equipment Technician	District Hospital	0.5
Specialist - Clinical	Referral Hospital	4
Specialist - Community Dental	Provincial Hospital	1

Reaching these facility-based targets will require increasing the total number of oral health professionals over 7 years to an additional 302 providers. This will substantially decrease the gap between the accessibility of oral healthcare in Rwanda and that of world-class health systems in the developed world, to a ratio of approximately 1:35,000.

Table 87. Oral Health Workforce Targets 2011-2019

	2010 - 11	2011 - 12	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19	Total Increase (2012 - 2019)
Dental Assistant Program	1	1	1	10	28	51	74	97	120	119
Dental Therapy Program	105	105	132	168	193	213	233	253	273	168
Dental Surgery Program	10	10	10	10	10	10	10	14	18	8
Other*	6	6	7	8	9	10	11	12	13	7
DENTISTRY TOTAL	**122**	**122**	**150**	**196**	**240**	**284**	**328**	**376**	**424**	**302**

*Includes the following: Community Dental Specialist Program, Clinical Specialist Program, Lab Technician Program, Equipment Technician Program

B. Infrastructure and Equipment

Simple equipment and infrastructure such as dental chairs and dental exam rooms are often in poor condition or are entirely absent in facilities that should be providing dental care. The School of Dentistry also has insufficient dental chairs, space, and educational tools such as mannequins, to train students. Through the HRH programs, basic infrastructure and equipment will be provided to the School of Dentistry and facilities to enable them to provide quality dental care and teaching.

C. Student Targets

Meeting the oral health workforce needs will require a careful scale-up and expansion of the current limited training program. SOD will expand the current dental therapy program to include dental assistants, dental surgeons, community dental specialists, laboratory technicians, and equipment technicians will be trained. Given the projected workforce needs mentioned above and some attrition, it will be necessary to scale-up to enrollment of 61 first year oral health students annually by 2014.

Table 88. Dental Student First-Year Enrollment Targets by Program, 2012-2019

Program	2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
Dental Assistant Program	10	20	25	25	25	25	25
Dental Therapy Program	25	25	25	25	25	25	25
Dental Surgery Program	5	5	5	5	5	5	5
Community Dental Specialist Program	1	1	1	1	1	1	1
Clinical Specialist Program	0	2	2	2	2	2	2
Lab Technician Program	1	1	1	1	1	1	1
Equipment Technician Program	2	2	2	2	2	2	2
TOTAL INTAKE	**44**	**56**	**61**	**61**	**61**	**61**	**61**

D. Curriculum and Clinical Rotations

1. Curriculum

Oral health professionals will be trained through an integrated curriculum design is that offers students different degree options depending on interest, resources and entry level requirements. A shared curriculum totaling five years is proposed to simultaneously train three levels of oral healthcare personnel, as shown in Table 89.

Table 89. Progression in Integrated Curriculum and Degrees Earned

Year Completed	Degree Earned
One	Dental Assisting certificate (DA)
Three	Dental Therapist degree (BDT)
Five	Bachelor of Dental Surgery (BDS)

During the application process for admission to the College, students meeting the minimum entry requirements have the opportunity to select their desired degree track. Furthermore students who originally planned to graduate earlier in the program have the opportunity to stay in the program longer and graduate with a higher level degree. These opportunities will create higher program retention.

The curriculum trains all three oral health degree categories simultaneously beginning in the first year. Should a student be unable to reach the original mark for graduation, there is an opportunity to graduate early with a different degree. This allows for increased potential for graduation with marketable skills even if unexpected circumstances arise. This also creates the potential for re-entry for advanced training of oral health cadres who would like to upgrade.

Because the SOD is an entirely new venture in Rwanda, and entirely new cadres of health professionals will be trained, significant work must go into developing the curriculum. A curriculum expert in oral health will be contracted to do this work, in consultation with Rwandan and US faculty, in the Planning Phase of the HRH Program.

2. Clinical Rotations

During the clinical rotations built into the curriculum, advanced students will be provided with opportunities to mentor more junior students. Additionally, the final clinical rotation for the dental surgery students is comprised of teaching and mentoring in clinical sites for ten weeks.

These mentorship opportunities are designed to foster future faculty members and instill a team oriented approach to teaching and treatment.

Another important element of the training program is community education and dental outreach. Dental assistants will be trained to provide effective oral health outreach programs in Rwandan communities and schools, where they are urgently needed. The increased number of oral health professionals will ensure that more human resources are available for this type of outreach.

E. Faculty Requirements and US Academic Consortium Involvement

Currently, there are only 5 faculty members in the KHI dental therapy program, none of whom is Rwandan. To staff the SOD, more faculty will be needed. A minimum of seven instructors, dedicated full time to teaching, will be required for the program to run at capacity. At present, local faculty are adequately trained to teach most, but not all, coursework and clinical training modules. Therefore, US faculty will be required to both mentor local faculty and to fill in gaps in teaching needs. New Rwandan oral health professionals graduating from the program will progressively fill these faculty positions.

Table 90. US Dentistry Faculty, 2012-2019

2012 - 13	2013 - 14	2014 - 15	2015 - 16	2016 - 17	2017 - 18	2018 - 19
2	2	2	2	2	1	1

The two initial US faculty members will be knowledgeable in all basic fields of dentistry required to mentor, teach, and assist through 2016, after which one US faculty member will provide more advanced training for upcoming surgeons through 2018 (See Table 91).

Table 91. Subject Areas for US Faculty Instruction

Through 2016	Through 2018
Periodontology	Advanced Oral and Maxillofacial Surgery
Fixed Prosthetics	Advanced Fixed Prosthodontics
Removable Prosthodontics	Advanced Removable Prosthetics
Pediatric Dentistry	Advanced Pediatrics
Behavior Management	Advanced Oral Pathology
Oral hygiene and counseling	Advanced Clinical Radiology
Clinical Radiography	Orthodontics
Clinical Oral Surgery	
Operative Dentistry	

US faculty will directly mentor existing Rwandan faculty to strengthen human resources. In addition to mentoring and providing support to Rwandan faculty in day-to-day activities, special training programs will be devised. US faculty will partner with Rwandan faculty to provide continuing professional development for the existing workforce. This will ensure that practicing oral healthcare workers maintain the highest levels of clinical practice and the most current knowledge and techniques throughout the duration of their careers. Additionally, US faculty will work with current Rwandan faculty to provide inter-professional development, where dentists and oral health specialists can provide oral health knowledge and training to nurses, physicians, and other health specialists. This will help better integrate oral health into Rwandan healthcare.

This partnership will build an educational training program of the quality found in developed countries. After seven years, Rwandan faculty will be fully empowered, self-sufficient, and able to sustain the oral healthcare system in the future. This flagship program design may become a model for other resource-constrained countries.

Interdisciplinary Education of Healthcare Professionals

Appendix 9

Appendix 9. Interdisciplinary Education of Health Professionals

Interdisciplinary health science education trains dynamic health professionals to function effectively as a team under constantly evolving models of care provision and with new health information and medical advances. It emphasizes problem solving and teaches future health care professionals from the different disciplines to work together as members of a health care team to provide optimal care to their shared patients. It also provides opportunities for the different health fields – medicine, nursing, oral health, and health management – to bring the strengths of their respective disciplines to bear on the subject matter.

To achieve such synergy, interdisciplinary education must be started at the undergraduate level. Students who study together as peers will have a natural respect for each other's professional preparation; therefore, undergraduate courses in the physical and social sciences should be interdisciplinary whenever possible. There are several crosscutting topics (e.g., statistics, research design, measuring and improving quality, bioethics, leadership, social justice, health disparities, professionalism) that are becoming essential across disciplines. Interdisciplinary training has the added benefit that it allows for efficient use of resources by training multiple cadres in these shared thematic areas at once.

As in most of the world, health care in Rwanda is organized into – and therefore delivered through – silos of specialty and subspecialty care. Consequently, health education programs are structured into didactic learning by organ system and clinical clerkships organized by specialty. Topics that do not fit into a single specialty but are relevant to all health professions are currently addressed primarily in didactic sessions and include: ethics, professionalism, community health, behavioral sciences, and clinical reasoning, among others. Efforts to date to integrate these subjects into the clinical training have been limited. In addition, topics that recently have been or are currently being worked into US school curricula, such as leadership, innovation, social justice and how to function effectively on a health care team, are not part of the current medical or nursing school curricula in Rwanda.

During the first year of the HRH Program in Rwanda, distinct syllabi to enable a team training approach for crosscutting areas will be developed. In addition to classroom learning, integrating teaching in these topics into the clinical years will be important to promote their actual practice, and so they will be addressed in both the preclinical and clinical settings. Teaching methods will advance from theoretical didactic presentations early in training to multidisciplinary case discussion of "real patients" during the postgraduate training. Faculty development will also be included across teaching facilities, so that modeling and reinforcement of the interdisciplinary approach to care can be incorporated into ward rounds and bedside teaching.

A core group of Rwandan and US faculty, with ideally one representative from each of the health professions and medical specialties, should comprise the Interdisciplinary Integration Committee. This group would develop the curricula and syllabi for the different subject areas and will examine placement of these topics across the specialty training programs to ensure continuity and coordination, e.g. joint rounds, case presentations by students from multiple disciplines, jointly designed and implemented quality assurance projects. This will require 3 FTEs, including 1 U.S. faculty and 2 Rwandan faculty, but will require no new infrastructure, as interdisciplinary training will be fully integrated into the existing program.

Assessments for this portion of the health curriculum will be devised for the different health professions for both student and postgraduate levels. Determination of core competencies and skill sets will be

used where they already exist and adapted or (as necessary) created for use in the local context. Competencies in the crosscutting subject areas will be evaluated by both standard measures (e.g. written or oral exams, essays, final projects) and also through observations of structured clinical encounters and observation in actual clinical settings. All students and postgraduates will need to demonstrate proficiency in these areas before progressing to the next level of training or graduating.

Table 92. Crosscutting subject areas

Category	Specific Topics	Examples of content
Foundational Principles	Biopsychosocial-spiritual model of health	WHO guidelines re: determinants of health
		Whole-person healthcare
		Role of multidisciplinary team
	Professionalism	Professional values
		Professional responsibilities
		The provider-patient relationship
	Ethics	Personal and Professional Ethics
		Ethical medical decision making
		Professional Boundaries
		Resolving ethical challenges & conflicts
Clinical Basics	Communication skills	Basic medical interviewing skills
		Advanced communication skills for complex clinical situations
		Motivational Interviewing
		Shared decision making
	Physical diagnosis skills	Basic Level
		Advanced Level
	Clinical Decision Making	Gathering pertinent data (biopsychosocial-spiritual model)
		Applying basic science knowledge, clinical guidelines and evidence to specific clinical situation
		Seeking expert advice and feedback
		Seeking patient input – Shared decision making
	Evidence-Based Medicine	Interpreting medical literature in Rwandan context
		Identifying need for new research
		Use of point of care electronic resources
	Self-Directed Learning & Lifelong learning Skills	Self-Assessment
		Goal Setting
		Reflection
		Seeking feedback on performance
Context of Health Care & Special Populations	Community & population health	Health issues specific to Rwandan context
		Community health assessment
		Prevention strategies

	Cultural Competence, Health disparities & Social Justice	Working with patients from diverse cultures
		Causes and effects of health disparities
		Role of health professionals in social justice
		Self-assessment of health beliefs and potential conflicts
	Physical Health/Mental Health Interface	Effects of physical health on mental and spiritual well-being
		Effects of mental health & trauma on physical health
	Care of dying patients	Team approach to palliative care
		Symptom management
		Social, emotional and spiritual care for patients and families.
Quality of Health Care Delivery	Effective Interdisciplinary Teams	Role of team members
		Team Communication
		Managing team projects & patient care
	Continuous Quality Improvement	quality monitoring
		PDSA cycles for quality improvement
		Innovations in clinical care
	Management of health systems	Basics of health financing
		Assessing clinical effectiveness
		Systems design & issues
		Patient safety
Teaching and Leadership skills	Teaching Skills - Teaching to Teach Curriculum	Giving effective feedback
		Learning contracts
		Evaluation methods
		Lecture methods
		Small group teaching
		Problem based learning
		Clinical supervision
	Leadership Skills	Needs assessment
		Setting & communicating vision
		Gathering stakeholder input
		Designing innovations & fostering positive change
		Managing concerns & problem solving
		Negotiation skills
		Evaluating effectiveness
	Scholarly skills	Evaluation of innovations (e.g. clinical, teaching) & new research – qualitative & quantitative
		Presentation, writing and publication skills

Increasing the Number of Female Health Professionals

Appendix 10

Appendix 10. Increasing the Number of Female Health Professionals

I. Current Situation

Women health professionals are underrepresented in all health professions, with the exception of nursing and midwifery. This problem is particularly acute in medicine. Of the 107 first-year undergraduate medical students in Rwanda, only 22% are women (Table 93). The percentage of female postgraduates is even lower—of the 34 post graduates that enrolled last year, only 5 (15%) were women (See Table 94).

Table 93. First-year Undergraduate FOM Enrollment, by Gender

Year	Men	Women	Total	% Women
2004	91	19	110	17%
2005	46	7	53	13%
2006	73	9	82	11%
2007	71	16	86	19%
2008	111	24	135	18%
2009	74	15	89	17%
2010	83	24	107	22%

Table 94. First-year Postgraduate Enrollment, by Gender

Year*	Men	Women	Total	% Women
2005	26	0	28	0%
2007	13	2	17	12%
2008	29	7	48	15%
2010	29	5	34	15%

*No new postgraduates were enrolled in 2006 and 2009.

As evident in the tables above, the rate of female participation in both undergraduate and postgraduate medical education is increasing, though at a slow rate. The Ministry of Health is dedicated to promoting gender equity in health sciences, and will increase the number of women in medicine through a campaign of women role models and by adjusting benefits and schedules in hospitals to accommodate mothers, as described below.

A. Barriers for Women Physicians

According to the women physicians at CHUK, one of the main barriers to women entering the field of medicine is a medical education system that does not align with Rwandan cultural practices. It is perceived as very important for Rwandan women to have children, and to have them at a young age. The intensive years of unpaid study, demanding schedule of doctors, and posts outside Kigali are not conducive to women having a family, as women are the primary caregivers in Rwanda. Another problem is that girls have historically been underrepresented in the sciences in secondary school, leading to low medical school enrollment. While this has been improving with the introduction of all-girl secondary school science programs, cultural expectations do not favor girls in

the sciences, and careers in scientific fields are often not seen as an option. The Ministry of Health is dedicated to promoting gender equity the health sciences, and will increase the number of women in medicine through a campaign of women role models and by adjusting benefits and schedules in hospitals to accommodate mothers.

II. Strategies to Recruit and Retain Women Physicians

Leaders within the Government of Rwanda understands the challenges that women face in the health workforce. It is important to have others join them in being publicly vocal about the possibilities for women in medicine and to change the public attitude toward professional women. As part of the recruitment strategy to increase enrollment in the medical school, the Ministry of Health will rally key women doctors to share their stories with prospective medical students. However, because girls must decide at the end of primary school to pursue the sciences, sessions with younger students focusing on women in the sciences will also be necessary to increase the future pool of women recruits. Women doctors will hold information sessions in Kigali and Butare specifically with girls and young women considering entering the sciences or, specifically, the field of medicine to discuss their concerns and share insight on how to balance a family and a medical career.

The campaign will also form part of the publicity around the new HRH Program, which has already generated significant interest in the Rwandan media. Women health professionals will be very visible in speaking to the press in all of the HRH launch and scale up activities, taking the opportunity to explain the importance of women in medicine and the opportunities professional mothers provide for their families. This campaign will target not only the field of medicine, but also oral health and health management professions.

Once women students are recruited into the Faculty of Medicine, it is essential to provide conditions that make it possible to retain them while respecting cultural preferences. Women should also be given equal opportunity to go on for postgraduate training. This will involve mentoring of young women medical students by women doctors, especially specialists, during the undergraduate years to encourage them to join the specialties. Typically, graduates of the Faculty of Medicine are required to fulfill a two-year term of service at a District Hospital immediately following their graduation. However this requirement will be waived for women physicians as an additional incentive to join specialty training programs.

Mentoring during postgraduate training will be a primary component of the campaign to increase the number of women specialists in Rwanda. Because there are currently insufficient Rwandan women doctors, US mentors will play a huge role initially. Care will be taken in the recruitment of US faculty to include women in every specialty so as to ensure an adequate pool of specialist women mentors. This special attention will hopefully improve the recruitment of women into both the undergraduate and postgraduate programs, and improve their retention in these programs.

Finally, the FOM and MOH will study a package of benefits with consultation from women doctors in Rwanda and current women medical students that will allow women to be mothers *and* health providers. Benefits could include: flexibility in work schedules to respond to women's family responsibilities, longer maternity leaves, the ability to work 60% or 80% instead of full time, and combining clinical positions and research to provide more flexibility. Women doctors with families may also be given priority for posts in Kigali, where their spouses are likely to work and children likely to go to school. Such a package of benefits may entice more women to enroll in medical school, and it will enable the health system to retain talented women doctors who also wish to have families.

A group comprised of representatives from Rwandan educational institutions, Health Cadre Sub-Groups, and the US Academic Consortium, will be tasked with leading activities related to the recruitment and retention of women students in health education programs in Rwanda. This group will meet once per month during the Planning Phase, and phase to quarterly meetings thereafter. The group will be facilitated by the HRH Program Coordinator from the HRH Program Support Unit.

A. Targets

Gender inequity is a serious problem for medicine in Rwanda, and it will take many years to reach full parity. The problem begins in secondary school, where fewer women than men study the sciences, and thus fewer women are eligible to enroll in medical school. These small cohorts then provide a limited pool from which to recruit into the postgraduate programs. The strategies described above will help to increase enrollment in the undergraduate and postgraduate programs, and ultimately keep women in medicine. To begin to increase the pool of potential women doctors, a 2% annual increase in women enrolling in the undergraduate program will be sought beginning with the HRH Program's initiation in 2012. By the Program's close in 2018, 36% of undergraduate medical students should be women (Table 95). The strategies aiming to increase women in the sciences in secondary school students will not begin to bear fruit until 2017 or later, so the proportion of women in medicine is expected to continue to increase beyond the life of this project.

Table 95. Undergraduate Enrollment Targets, by Gender

	2010	2011*	2012	2013	2014	2015	2016	2017	2018
Women	24	22	24	26	28	30	32	34	36
Men	83	78	76	74	72	70	68	66	64
Total	107	100	100	100	100	100	100	100	100
% Women	22%	22%	24%	26%	28%	30%	32%	34%	36%

*The class of 2011 will not enroll until July. These figures are estimated based on 2010 figures and the new class enrollment target of 100.

Due to the limited number of undergraduates feeding into the postgraduate programs, it will take time to increase the number of women in the specialties. In addition, because the number of postgraduate students is scaling up without a comparable scale up in the undergraduate program, many postgraduates will be recruited from the pool of General Practitioners, in which there are relatively few women. While these obstacles will slow the scale-up of women in the specialty programs, ambitious targets have nonetheless been set within these bounds, aiming to enroll 4 times the number of women enrolling in postgraduate programs in 2018, compared with 2012 (Table 96). A 1% increase in the total proportion of women first-year postgraduates is expected each year following the HRH Programs' commencement in 2012. As in the case of undergraduate enrollment, the results of many of the strategies implemented through the HRH Program will not be seen until after the completion of the project, when young women have passed through the science programs of secondary schools and entered and graduated from medical school.

Table 96. Postgraduate Enrollment Targets (All Specialties), by Gender

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Women	5	9	14	17	18	20	21	22	23
Men	29	51	74	89	88	89	88	87	86
Total	34	60	88	106	106	109	109	109	109
% Women	15%	15%	16%	17%	18%	19%	20%	21%	22%

Promoting Health Sciences Research

Appendix 11

Appendix 11. Promoting Health Sciences Research

The Government of Rwanda recognizes the importance of building research capacity. It helps to improve clinical practice, inform health programs and share knowledge with the broader health field around the world. The pursuit of research can be supported by both new and existing structures. For example, training and expertise provided through the Rwanda School of Public Health, which supports health research capacity in Rwanda. In addition, currently both a National Ethics Committee (RNEC) and several institutional ethics committees are already in place, although, additional capacity building is needed for the newer institutional ethics committees.

One of the core areas and mandates of RUMHS is research and research capacity building in peripheral hospitals and clinics, making a centralized structure within the University a necessity. The new RBC will therefore include a Health Sciences Research Center, which will serve the Faculty of Medicine and Schools of Nursing in addition to the other RBC institutions. The Health Sciences Center would benefit from US mentors from the academic partnership to enable its establishment. The Center will serve to coordinate research efforts across the health sciences; provide support to Rwandan faculty to develop research proposals, apply for funding, hire and train adequate staff to conduct research, and specifically assist and train staff in the analysis and publication of their work in internationally recognized journals. The center will also develop research methodology and research ethics courses; connect international researchers with Rwandan counterparts with similar research interests; and provide (financial) administrative support for research projects.

The Ministry of Health values research that can help the country develop evidence-based healthcare provision, policy, and guidelines. The center will aid the Ministry of Health in developing research priorities in Rwanda and to translate research into policy and practice (Evidence Based Healthcare). The medical center will also keep an updated database of all ongoing research in Rwanda, in order to avoid duplication and wasted resources. The MOH also maintains a fund for domestic research on health issues of national importance. Unfortunately, these funds often go unused, due to the lack of high quality research proposals. The Health Sciences Center can serve as a conduit for Rwandan scholars to develop relevant proposals to apply for these funds, helping to guide research to produce the evidence the MOH and health workers need to make decisions.

The Health Sciences Center will provide support to Rwandan faculty interested in conducting research in Rwanda, and US mentors will play a critical role in providing this support, especially in the initial phase of establishing the Center. Rwanda has recognized that research plays an important role in improving healthcare. Nevertheless research training has been sporadic and unorganized in Rwanda up to this point. Rwandan scholars new to research may need guidance when learning how to develop and frame their research questions and how to write a proposal that clearly explains their methodologies and hypotheses. US mentors will use their expertise in this area to help their Rwandan colleagues develop these proposals, as co-investigators where desired. The Health Sciences Center will serve as a clearinghouse for funding opportunities, and will keep a catalogue of opportunities and information on application processes to help Rwandan researchers realize their projects. US mentors will be critical in building this mass of information, passing along information on grant opportunities they are apprised of through their own universities, and also in guiding their Rwandan colleagues through the grant application process. Finally, the Center will provide support in scientific writing and understanding the peer review process, helping Rwandans to publish their research findings in internationally recognized journals. With their substantial experience in this area, the US mentors will help Rwandans to write scientifically sound articles, to select appropriate journals for their submission, and to navigate the submission process.

The Health Sciences Center will help the schools and teaching hospitals to train students in research methods and ethics. Initially research methodology was a core component of the MMED program curriculum, unfortunately this has not always been possible and many MDs, nurses and other healthcare professionals have not acquired basic research skills. US mentors will help develop the curriculum for these course components, and also ensure that research training goes beyond the classroom and into the teaching hospitals. Students will be exposed to ongoing research projects in the teaching hospitals and the field during their clinical training and, where appropriate, participate in this research.

In each specialty and program, an exceptional faculty member will be selected by his/her colleagues to serve as the departmental Head of Research. This individual will help coordinate research activities within their field, and especially with the junior faculty and postgraduates. US mentors will work with all of their Rwandan colleagues to hone their research skills, but an individual US mentor will be assigned to the Head of Research in each department to provide more intensive support. This will help produce the general research skills and also the leadership that will allow research training to eventually be conducted largely by Rwandan faculty.

In line with the interdisciplinary curriculum being integrated into the health sciences education as part of the HRH Program, interdisciplinary research will also be key in providing relevant answers to some of Rwanda's most pressing research questions. The Interdisciplinary Coordinating Committee overseeing the curriculum and the departmental Heads of Research will play a key role in the Health Sciences Center, helping to form relationships across the different cadres and programs and join individuals or groups on collaborative research projects. US mentors will play a key role in this, as interdisciplinary research is becoming more common in the US, and many have experience in this area. The Health Sciences Center will also be responsible for locating international funding and propagating Rwanda has a center of excellence in research conduct according to internationally accepted standards. The Center can be a central organ in advocating for research and the translation of research.

The Health Sciences Center will also serve as a linkage point for international institutions interested in doing work in Rwanda, including both those within the academic partnership and other academic or research institutions. All research projects must be approved by the Rwandan National Ethics Committee (RNEC) or institutional Ethics Committees, once capacity is strengthened, and this submission process will allow for a point of contact where international researchers can find local counterparts with similar research interests for collaboration. The Center will also help connect Rwandan researchers looking for international partners with relevant institutions or individuals. Where Rwandans lead studies as Principal Investigators, the twinning process could be enabled through the collaboration of US faculty as co-Principal Investigators. US mentors will be important in both of these processes, helping to make contact between the Center and other researchers in their home institutions or colleagues elsewhere. Additionally, their international experience may help provide ideas for international partners for Rwandan researchers who are looking to initiate a research project.

Financial and administrative support will be provided to Rwandan researchers and their partners through the Health Sciences Center. For example, the Center can provide support, as needed, in assembling institutional information for a grant submission, hiring local staff with grant funds, reserving laboratories or other infrastructure, or in locally procuring research supplies. This support will hopefully lower the bureaucratic obstacles that international research projects may face when they partner with Rwandans, providing incentive to ensure full inclusion of Rwandan counterparts in these types of projects.

Through the HRH Program, an administrator will be provided to the Health Sciences Center to help get the Center up and running, especially focusing on coordinating the various educational and support programs and establishing databases of grant opportunities and international research contacts. However, the HRH Program will not be able to fund research projects. And, in addition to funding the research itself, financial resources beyond those included in the HRH Program will be required to improve research capacity in Rwanda, potentially through doctoral training programs abroad or more intensive training in-country than has been proposed here. Also, increased funding is required for Rwandan researchers to attend and present their work at scientific conferences. US faculty will mentor Rwandan counterparts on accessing funding for these types of activities through various external bodies (e.g. National Institutes of Health). Support through other partnerships outside of the HRH Program may also be obtained to support these endeavors.

New Positions Created through the HRH Program

Appendix 12

Appendix 12. New Positions Created through the HRH Program

This Appendix provides job descriptions for positions that are newly created for the HRH Program.

I. Administrative Support Officers

Administrative Support Officers will be recruited to support schools and residencies. The following institutions will have an Administrative Support Officer:

- Faculty of Nursing Sciences (1)
- School of Dentistry (1)
- Faculty of Medicine (1)
- Postgraduate Residencies (7; 1 for each main residency program, one to coordinate smaller residencies)
- 5 A1 Schools of Nursing and Midwifery (5)

II. Program Support Unit within the Medical Education and Research Unit and RUMHS

Within the Medical Education and Research (ME&R) Unit of the Ministry of Health, there will be 4 new positions created to support the HRH Program. Their titles and responsibilities are provided below:

A. Program Manager: Physicians and Dentistry

- Facilitate communication between the US Schools and residency directors, School of Public Health and School of Dentistry
- Coordinate activities during the Planning and Systems Strengthening Activities
- Develop pre-orientation materials for US faculty
- Organize annual orientation for US faculty
- Resolve any issues or concerns related to: selection of US faculty, performance of individual US faculty, selection of US school to lead US participation in each program focus area
- Coordinate the set-up of the Steering Committee and the physicians, health management and dentistry sub-groups during the initial start-up of the project, and/or providing hands-on administrative assistance to support the work of the various groups involved in the HRH Program as their staff is getting up to speed

B. Program Manager: Nursing and Midwifery and Health Management

- Facilitate communication between US Schools and the Faculty of Nursing Sciences, A1 Schools of Nursing and Midwifery
- Coordinate activities during the Planning and Systems Strengthening Activities
- Resolve any issues or concerns related to: performance of individual US faculty or schools
- Coordinate the set-up of the Steering Committee and the nursing/midwifery sub-group during the initial start-up of the project, and/or providing hands-on administrative assistance to support the work as their staffing is getting up to speed

C. Monitoring and Evaluation Officer

- Develop specific M&E plan by program
- Assure that systems used to collect indicator data are functioning at all sites where HRH Program will be operating
- Analyze data and produce reports on program progress
- Communicate regularly with M&E specialist within the SPIU to coordinate programmatic and financial assessments

D. Administrative Assistant to the Program Managers

- Development of pre-orientation materials
- Accounting
- Office Coordination
- Public Relations
- Filing

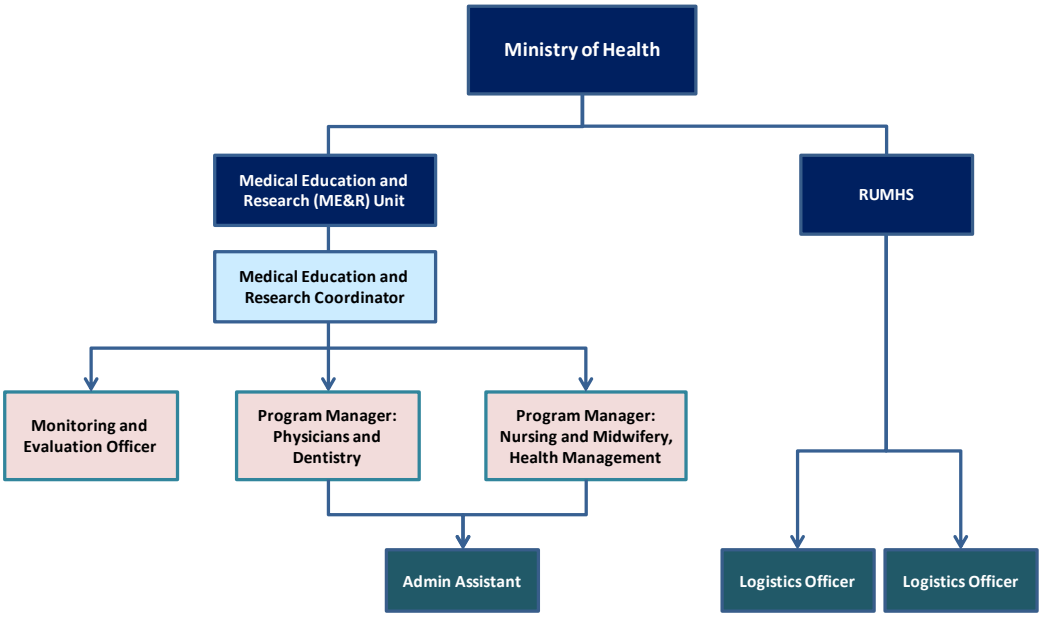
E. Logistics Officers

Two Logistics Officers will be hired for the HRH Program. They will sit within RUMHS but communicate closely with the Program Support Unit within ME&R. Their primary responsibilities will include coordination of the following areas for US faculty members:

- Licensure in Rwanda;
- Malpractice insurance;
- Residency and working visas;
- Logistics for orientation;
- Locating faculty housing (in Kigali and at other sites).

Refer to Figure 11 below for the coordination structure of program support under ME&R and RUMHS for the HRH Program.

Figure 11. Program Support Positions for the HRH Program



III. Equipment Technicians

Two full-time equipment technicians will be placed at each of the following referral hospitals: CHUK, CHUB, and Kanombe Military Hospital. In addition, the HRH Program will provide funding to employ one equipment technician each at the 5 referral hospitals. These individuals will be responsible for repairing equipment in all departments. The equipment technicians will undergo training courses every year to build their technical skills and capacity to repair a wide range of equipment.

Rwandan Institutions and Schools

Appendix 13

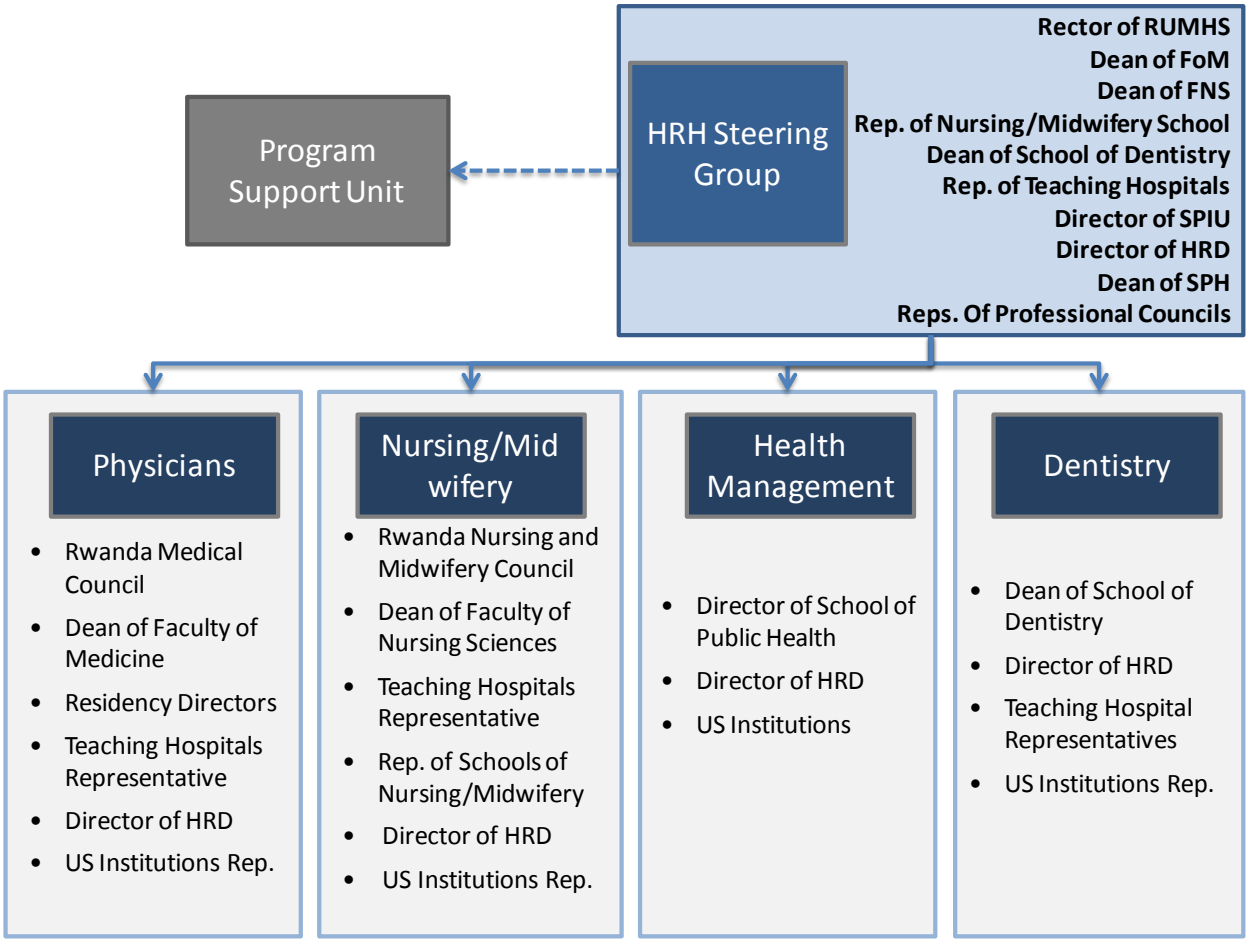
Appendix 13. Rwandan Institutions and Schools

This section describes the major Rwandan institutions involved in the design and implementation of the HRH Program.

- Health Cadre Sub-groups
- Rwanda Medical Council
- Rwanda University of Medical and Health Sciences
- Faculty of Medicine
- Faculty of Nursing Sciences
- A1 Schools of Nursing and Midwifery
- Nursing and Midwifery Council
- Nursing and Midwifery Taskforce
- Dental Program
- School of Public Health
- Teaching Hospitals

These institutions are represented in the HRH Steering Group and the associated Health Cadre Sub-Groups shown in Figure 12 below.

Figure 12. HRH Program Oversight



I. Health Cadre Sub-Groups

The Health Cadre Sub-Groups will oversee the work of each health cadre. Each sub-group is composed of the members listed in the figure above. They receive guidance from the HRH Steering Group, as well as program and administrative support from the HRH Program Support Unit. These Sub-Groups will guide program development and provide a forum for discussion and decision-making related to the HRH Program.

II. Rwanda Medical Council

The Rwanda Medical Council (RMC) is the licensing and regulatory body for physicians. Established in 2001 as a regulatory body governing all physicians in Rwanda, the RMC focuses on the following areas:

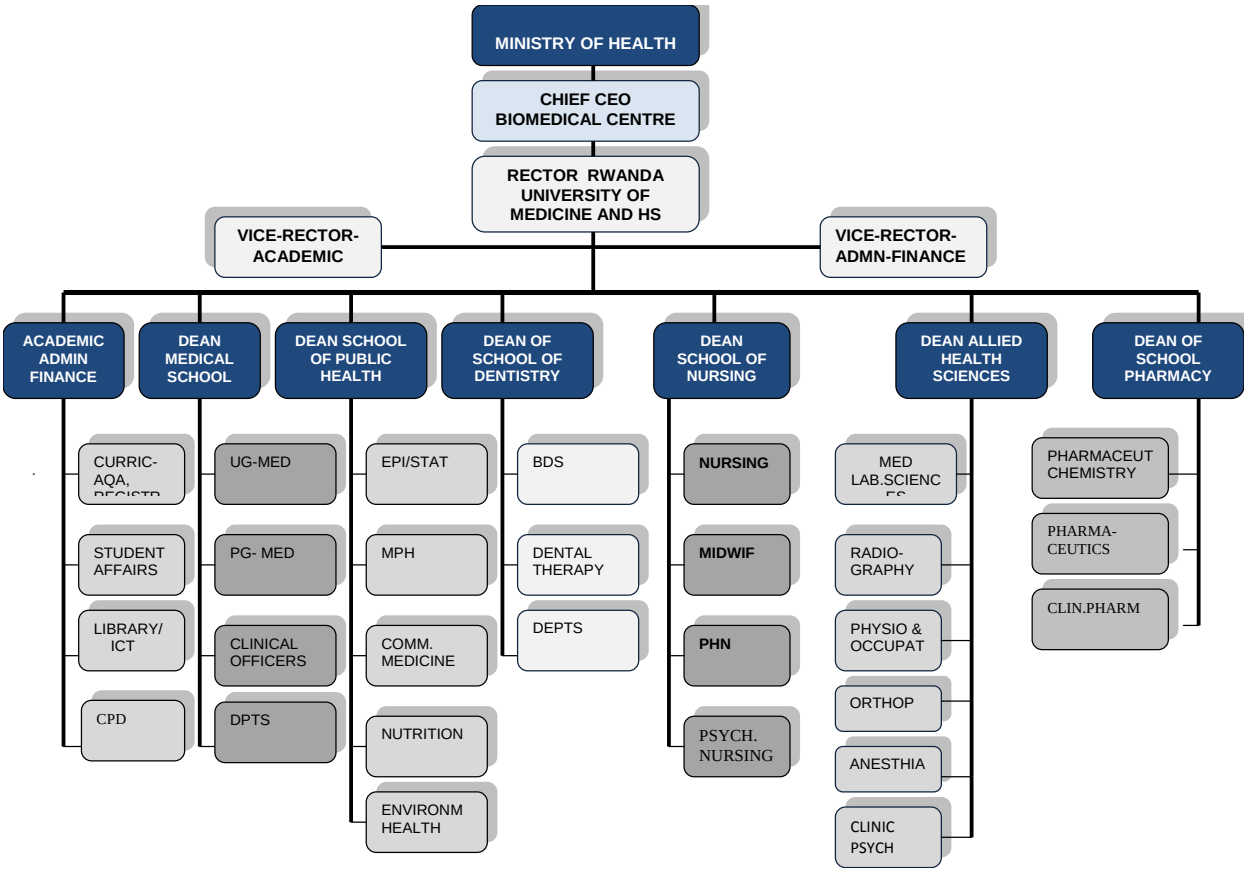
- Establishment of structures;
- Internal rules and regulations;
- Code of Ethics;
- Registration of practitioners;
- Patients' rights;
- Formation of laws on the organization, functioning and competence of the Medical Council.

On February 8th 2011, a new National Council for the Rwanda Medical Council was elected. This group is focused on establishing a Continuing Professional Development Program and malpractice legislation.

III. Rwanda University of Medical and Health Sciences

The Faculty of Medicine of the National University of Rwanda (NUR) will be devolved from NUR and merged with the Kigali Health Institute and the School of Public Health to create the new Rwanda University of Medicine and Health Sciences (RUMHS). This new center of learning will also move from Butare to Kigali. These changes emanate from a decision in 2010 to move the oversight of physician education from the Ministry of Education to the Ministry of Health. RUMHS will educate physicians at undergraduate and postgraduate levels, masters-level nurses and oral health professionals. In addition it will incorporate the School of Public Health which will educate health managers, epidemiologists and public health specialists. The organizational structure of RUMHS is shown below in Figure 13.

Figure 13. Organizational Structure of RUMHS



IV. Faculty of Medicine

The National University of Rwanda (NUR) is currently located in Butare in southern Rwanda. The average annual enrolment at the Faculty of Medicine in Butare is 100 students with approximately 80 physicians graduating each year. It is a 6-year program with two pre-clinical years, four clinical years and a one-year internship after graduation. After the Genocide in Rwanda in 1994, NUR closed due to the massive loss of students and academic staff. The University reopened in 1997, and the Faculty of Medicine established the postgraduate program in 1998. An official re-launching of the in-house post-graduate program took place in 2005 with the assistance of on-site expatriate staff and visiting faculty.

In the Faculty of Medicine, there are 7 faculty departments: clinical biology, internal medicine, pediatrics, obstetrics and gynecology (obstetrics/gynecology), surgery, anesthesia and ear, nose, and throat (ENT). There are currently 7 residency programs for postgraduates: pediatrics, internal medicine, surgery, obstetrics/gynecology, anesthesiology, family and community medicine (FAMCO) and ENT. The general structure of the postgraduate program is 4 years with 12 calendar months and 30 days of leave per year. Most of the physicians enrolled in the postgraduate program are funded by the MoH and have worked at the district hospitals for at least 2 years before enrolling in the residency program.

The academic year starts in January and ends in September. This will soon change to an academic year that begins in August and ends in June. There are 18 weeks of teaching and clinical rotations and 2 weeks of examination.

V. Faculty of Nursing Sciences

The Faculty of Nursing Sciences (FNS) is the center of higher learning for nurses, housing education programs for A0 and higher level nurses. FNS also trains midwives and mental health nurses to A1 level. FNS currently educates all A0 nurses in Rwanda. The A0 level is equivalent to A2 training plus 4 years of higher education (bachelor degree). FNS provides a Bachelor of Science in Nursing (BScN), A0 degrees in General Nursing and Nursing Education, as well as A1 diplomas in Mental Health Nursing, and Midwifery. After 2011, however, FNS will no longer issue diplomas or degrees below a bachelor's for general nursing. They will still continue to provide A1 degrees for midwifery and mental health.

For higher degrees, FNS offers a small master's program in critical care nursing (8 students). The Administration is exploring the possibility of starting post-baccalaureate programs in pediatric nursing and surgical nursing. They also anticipate creating bridging programs for A1 nurses and midwives to obtain bachelor's degrees. Most of the current faculty members at FNS are expatriates, since there is no in-country access to post graduate programs in nursing education. In order to insure a steady stream of well-educated Rwandan nurses who will serve as faculty at FNS and the 5 A1 Nursing and Midwifery schools, a master's degree in nursing education will be developed at FNS.

VI. A1 Schools of Nursing and Midwifery

The A1 Schools of Nursing and Midwifery are located in Byumba, Kabgayi, Kibungo, Nyagatare and Rwamagana. These schools were re-organized and placed under the Department of Nursing in the Ministry of Health in 2007. Two of these schools, Rwamagana and Kabgayi, were previously operated by faith-based organizations. All five schools use the same curriculum and operate on the same schedule with regard to the amount of on-site clinical instruction that students are required to complete. Each school is located in close proximity to a district hospital, where students receive much of their basic clinical instruction. All direct-entry students study general nursing in year 1 and choose either nursing or midwifery in year 2. Each school of nursing and midwifery currently educates approximately 150 students, about half of which are in the midwifery track. All 5 schools also send students to the national referral hospitals for clinical instruction of complex medical problems and other specialty areas.

VII. Nursing and Midwifery Council

The Nursing and Midwifery Council is responsible for the training curricula of nurses at all levels. They recently developed the curricula to train new A1 nurses and to upgrade existing A2 nurses to A1 level. The Nursing Council has been in the lead on creating the programs to upgrade the existing corps of A2 nurses as quickly as possible. They will continue to play a central role in this effort as well as in leading the thinking on how to train dedicated anesthesia, trauma, midwifery, neonatal, pediatric and orthopedic nurses.

The Council takes responsibility for certifying nurses, accrediting nursing schools and ensuring the overall quality of training. The Nursing Council is responsible for introducing any new nursing specialties. The current nurse specialties are confined to mental health and midwifery.

VIII. Nursing and Midwifery Taskforce

The Nursing and Midwifery Task Force is responsible for driving nurse training programs and acting as an advocacy group for nursing within the MoH. This group will act as the driving force behind the scale-up

of nursing programs. The Task Force is currently understaffed, however, for the number of responsibilities that it will assume. As a result, the Task Force will hire a Nurse Training Coordinator to support its work.

IX. Dental Program

Rwanda does not currently have a formal dental school but one will be established under RUMHS. Presently, the Kigali Health Institute offers a Bachelor degree in dental therapy. The program graduates about 27 dental therapists per year. Therapists are trained to provide basic, non-invasive restorative and periodontal procedures and simple extraction.

X. School of Public Health

The National University of Rwanda School of Public Health (NURSPH) opened in 2001 in order to better align graduate profiles with the health needs of Rwanda. NURSPH replaced the former School of Public Health and Nutrition (ESPN). The mission of the School of Public Health is to improve the health status of the population of Rwanda through graduate education and in-service training; research and service; and to become a Center of Excellence in the Great Lakes region for distance education and complex emergency/disaster management studies. As of May 2011, the SPH enrolled 164 students, including 106 male students and 57 females students.

Presently, the School of Public Health offers two degree course programs: the Master of Public Health (MPH) and the Master of Science in Epidemiology. It also offers four modular certificate training programs in (1) Epidemiology, Bio-statistics and Computing applied to health science; (2) Research Methodology applied to HIV/AIDS (Strategic Information in support of improved HIV/AIDS programming), (3) Management of Health Services and (4) The Fellowship Program.

The School of Public Health has utilized regional and global partnerships to develop a series of academic programs, including certificate, diploma, and masters-level educational programs, a fellowship program in collaboration with Tulane University, and a series of Continuing Education Programs. The Tulane University faculty also serve as consultants to a number of multilateral organizations, including WHO, USAID, the World Bank, and the Global Fund.

XI. Teaching Hospitals

Currently, there are three Referral Hospitals acting as teaching institutions. However, during the HRH Program additional hospitals will be upgraded to teaching hospitals, and represented within Health Cadre Sub-Groups. A brief description of the existing teaching hospitals is provided here:

A. King Faisal Hospital

King Faisal Hospital (KFH) is a private non-profit institution, however it is an implementing agent of the Ministry of Health. In partnership with other agencies, KFH aims to promote, maintain and restore the health of all Rwandans within the region. KFH has 140 acute care beds, 8 intensive care unit beds, 33 post-operative beds, and two operating rooms. There are 444 staff at KFH. KFH is a major teaching hospital in Rwanda, and is widely recognized as a leader in quality of care within the country.

B. University Teaching Hospital of Kigali (CHUK)

The University Teaching Hospital of Kigali (CHUK) was established as a health center in 1928, and became a hospital in 1965. CHUK was established as a public teaching institution in 2000. CHUK has a capacity of 429 beds (last figure December 2008). CHUK has 748 employees, including: 97 physicians, 444 nurses (401 nurses and 43 midwives), 99 paramedics, 105 administrative staff and 3 support staff. Within the hospital, there are 15 clinical departments: internal medicine, pediatrics, surgery, anesthetics, emergency, ENT, dermatology, dentistry, ophthalmology, clinical consultation, pharmacy, laboratory, physiotherapy, medical imaging and obstetrics & gynecology. CHUK is administered by a Board of Directors and managed by a Medical Director supported by the Board of Directors, the Management Committee and the Executive Committee.

C. University Teaching Hospital of Butare (CHUB)

The University Teaching Hospital of Butare (CHUB) is located at Mamba, District of Huye, in the Southern Province of Rwanda. CHUB was founded in 1928 as The Butare Hospital. In 2000, CHUB was established by law as a University Teaching Hospital. With the passing of law No 41/2000 of the 7/12/2000 of the creation and organization of the CHUB, two institutions of the Faculty of Medicine of the NUR including the Teaching hospital (HUB) and the University Laboratory were combined under the name of the University Teaching Hospital of Butare. CHUB is one of the primary existing teaching institutions.

D. Kanombe Military Hospital (KMH)

Kanombe Military Hospital is currently a district hospital but is in the process of upgrading to a referral and teaching hospital by the end of 2011. Located on the outskirts of Kigali, KMH provides care to the military and is also open to the public.

Existing Health Education Partnerships

Appendix 14

Appendix 14. Existing Health Education Partnerships

The Government of Rwanda has successfully partnered with many foreign academic institutions. Teams of specialists frequently visit Rwanda for short periods of time to focus on a specific geographic region or area of health (HIV, women's health, surgery, community health, etc). This work has been valuable in treating some Rwandan patients, but the level of capacity transfer, and thus sustainability, of this type of engagement is usually limited. Even the programs that succeed in training a small number of Rwandan physicians or nurses in a particular procedure or technique cannot address the critical shortage of health professionals.

This type of engagement falls short of the scope and level of commitment requested for the HRH Program. However, these small partnerships are compatible with the goals of the HRH Program and contribute valuable relationships and expertise to health science education in Rwanda. Some of the most impactful of these existing programs will be directly folded into the HRH Program, such as the Yale partnership with the School of Public Health, University of Virgina's collaboration with the Department of Surgery at CHUK, and the University of Colorado's engagement with the Faculty of Medicine to develop the FAMCO program. Other, smaller health sciences training and education initiatives will be coordinated by the Ministry of Health to ensure alignment with the HRH Program. Additional partnerships outside of the HRH US Consortium provide an opportunity for training, exchanges, or other collaboration beyond the parameters of the HRH Program. For example, residents in Rwanda may access exchange programs with foreign institutions for sub-specialties that are not offered within Rwanda. Similar exchange arrangements already exist with some countries in the region and can be expanded to other countries. Other possibilities may exist for faculty from Europe to teach certain sub-specialties as part of defined curricula in Rwanda. The MoH will need to individually assess these opportunities.

Several academic partnerships already exist today and plan to continue in the future. Some of these partnerships are not immediately linked to formal training of health professionals but add value to Rwandan professionals through scientific exchanges and other collaboration. Table 97 provides detail about these partnerships and the level of support that is provided.

Table 97. HRH Partners in Rwanda

Partner	Country	Topic	Level of support
Boston University	US	Neurosurgery	Institutional agreement for collaboration and support, no specific teaching of Rwandans
BTC	Belgium	Not specific	Several visiting faculty for 2-week periods to teach
CIUF	Belgium	SOM	Visiting faculty, equipment (support ending)
Dalhousie	Canada	Anesthesiology	1 FTE for anesthesiology training
Duke University	US	Neurosurgery	Institutional agreement for collaboration and support, no specific teaching of Rwandans
GIZ	Germany	Not specific	Several German doctors deployed to Rwanda for clinical services, no specific mandate for training residents
Harvard University	US	District hospital	Support through US faculty, infrastructure, equipment, etc. for clinical services and training
KCMC	Tanzania	Faculty of Medicine	Agreement to do mutual visits and collaborate on research, possible exchanges
Makerere	Uganda	SOM	Agreement to do mutual visits and collaborate on research, possible exchanges
Muhumbili	Tanzania	SOM	Agreement to do mutual visits and collaborate on research, possible exchanges
University of Colorado	US	Family Medicine	2 FTEs dedicated to teaching FM program
University of Nairobi	Kenya	Faculty of Medicine	Agreement for mutual visits and research collaboration, possible exchanges
University of Pretoria	S. Africa	Faculty of Medicine	Agreement for mutual visits and research collaboration, possible exchanges
University of Virginia	US	Surgery	2 residents in Rwanda for research and clinical services, 1 visiting faculty member
VLIR	Belgium	Faculty of Medicine	Equipment, skills lab support, faculty visits (support
Western Ontario	Canada	HRH	Phasing out high level support to HRH
Yale University	US	Health Management	Curricula support for the School of Public Health

Past partners that are not likely to continue their support in Rwanda are not mentioned. In addition, there are other HRH-related programs that are considered out-of-scope but still provide valuable contributions to Rwanda. Some examples include research fellowships for advanced degrees offered through US Government or field epidemiology training from the US Center for Disease Control. There are also specific skill-building programs that are ongoing such as training on the insertion of Intra Uterine Devices and training on influenza management. Other trainings and support that target community health workers (CHWs) are also important but not included.

Current Health Workforce in Rwanda

Appendix 15

Appendix 15. Current Health Workforce in Rwanda

I. Introduction

Rwanda has already made impressive progress toward achieving its Vision 2020 targets in the health sector. Under the leadership of the MoH, "diseases of poverty," such as malaria, diarrheal disease, and many neglected tropical diseases have been rolled back,[19] and the tide has turned on the HIV epidemic.[20] This impressive progress has been achieved largely through efforts in communities and health centers by putting often simple and well-known prevention and treatment regimens into practice.[21]

Progress towards alleviating the burden of disease has stagnated, however, mainly due to the shortage of well trained health professionals. Rwanda currently does not have the capacity to provide quality treatment for many complicated cases of common diseases that are referred to hospitals, including malaria and pulmonary infections. These conditions are still the leading causes of death in hospitals. HIV and opportunistic infections are also preventable but remain a leading cause of hospital deaths.[22] Traumatic injuries and obstetric complications are unnecessarily grave threats due to the small number of specialists who are available to operate. Many treatable diseases, such as cancer, are *un*treatable in Rwanda due to insufficient expertise and equipment. Other conditions, such as cardiac infarctions, are treated improperly or too late. As a result, many Rwandans die unnecessarily each year in the country's hospitals.

The MoH seeks to reduce the burden of disease in the country by building a world class health system that provides high quality care for all Rwandans. To do so, the country must address four critical obstacles:

A. Severe shortages of health workers

B. Poor quality of health worker training

C. Inadequate infrastructure and equipment

D. Inadequate management of health facilities

A. Severe shortages of health workers

The World Health Organization (WHO) considers Rwanda as one of 57 countries worldwide with a critical shortage of health workers.[23] Rwanda has a population of approximately 10 million people, but there are only 633 Rwandan physicians.[24] The vast majority of physicians are general practitioners (GPs), with only 150 specialists practicing in Rwanda. There are only 6,970 Rwandan nurses. About 90% of nurses are A2 level which means that they have the lowest level of nursing

[19] USAID (2009).
[20] SCMS (2011).
[21] Binagwaho (2011).
[22] Ministry of Health (2011)
[23] Ministry of Health (2011).
[24] This figure includes Rwandan physicians only. There are an additional 99 General Practitioners and specialists from other countries working in Rwanda.

training and only completed the last three years of secondary school education. With this level of training, they would not meet training requirements to be certified nurses in many other countries in the region. Health centers in Rwanda, the first tier of the health system, are frequently short of the 12 nurses that are minimally needed to staff each center. Some health centers have as few as 6 nurses. As for oral health, there are only 21 dentists in the country.

Rwanda's health workforce is insufficient by almost all metrics. The physician density is .06 physicians per 1,000 population which is well below the regional average of .19 and the WHO recommended density of 0.2 (Table 98). The nurse density is .70. Together this means that the health worker density in Rwanda is only .76 per 1,000 population. This is less than one third of the WHO minimum health worker density (HWD) of 2.3, a threshold to achieve very basic health outcomes. A much higher health worker density is required in Rwanda to achieve the country's ambitious health targets,[25] such as those defined in Vision 2020.

Table 98. Current Health Worker Densities (HWD) in Rwanda, Comparative Densities, and Targets[26]

Cadre	Current Total	Current Density*	Sub-Saharan Africa Density*	WHO Minimum Density**	Rwanda Vision 2020 Density
Physicians	633	0.06	0.19	0.20	1.00
Nurses and Midwives	6,970	0.70	1.02	-	2.00
Total	7,603	0.76	1.21	2.30	3.00
*Per 1,000 population					
Source: WHO (2006); World Bank World Development Indicators (2010); Naicker, et al (2009); Ministry of Health (2011).					

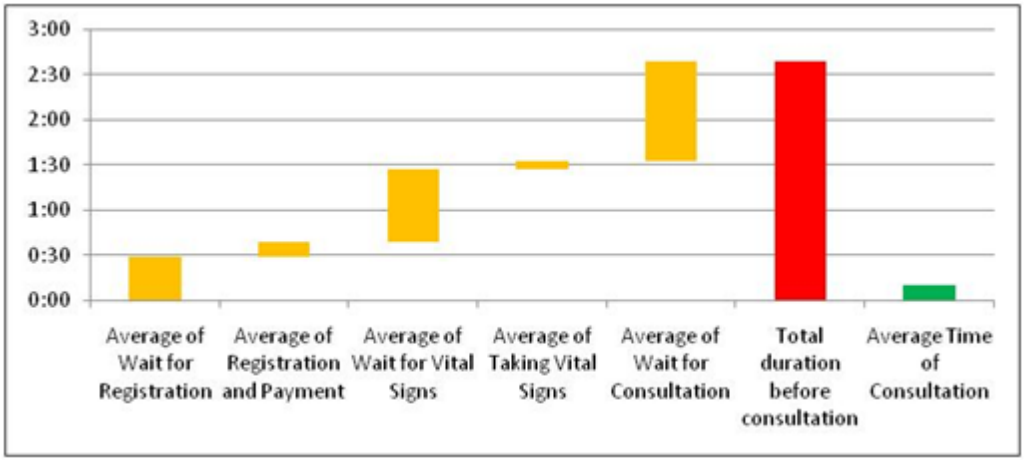
The insufficient number of qualified health workers in Rwanda has serious implications for quality of care. Doctors and nurses are overburdened and unable to provide prompt or ample attention to patients. As shown in

Figure 14, wait times to receive outpatient care are often prohibitively long in Rwanda. Patients in district hospitals wait an average of 2 hours and 38 minutes to receive care from a physician.

[25] WHO (2006).
[26] WHO (2006).

Physicians then spend, on average, about 10 minutes with these patients.[27]

Figure 14. Average Wait Times for Outpatients in District Hospitals (2010) [28]



An additional shortfall in Rwanda is that the distribution of health workers is uneven. Retention of health workers in rural areas is difficult because salaries are low and living conditions are less preferable. Also, the most significant shortages are often where health workers are most needed, far from urban centers. Uneven distribution is also a problem for doctors, and even more so for specialists. The majority of surgeons live in Kigali but most surgeries are performed outside of the capital.

B. Limited skill levels of health workers

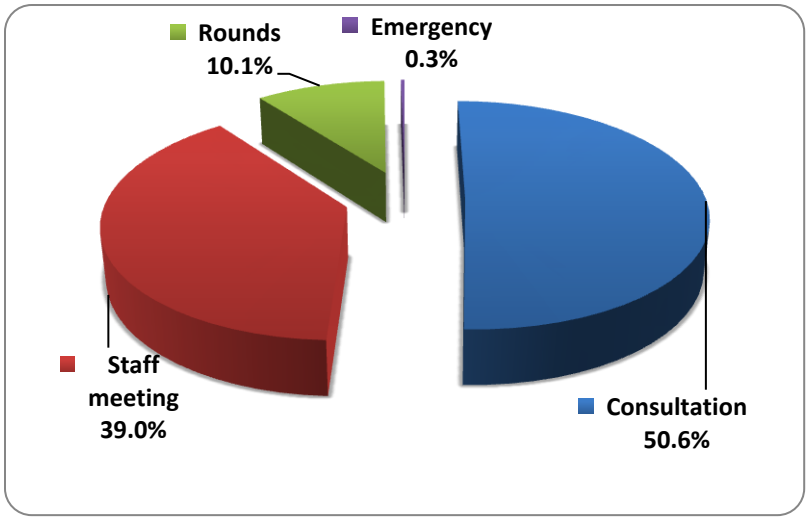
Most of the physicians in Rwanda are General Practitioners (GPs) which means that they completed medical school but not a residency program. As a result, GPs enter hospitals as physicians with only classroom preparation and minimal supervision and mentorship on rotations in health facilities. The few GPs who do enter residency programs also receive limited mentorship. Faculty members in teaching

[27] MoH (2011). Hospital Baseline.
[28] MoH and CHAI (2011a).

hospitals are often overburdened with other clinical duties and administrative duties. As a result, they spend only 10% of their time on rounds in the inpatient wards. The lack of time spent on rounds deprives students of an important learning opportunity. For a breakdown of how physicians typically spend their time in district hospitals, refer to

Figure 15.

Figure 15. Physician Time Spent by Activity in District Hospitals (2010)[29]



[29] MOH and CHAI (2011a).

Under the current system in Rwanda, there are woefully inadequate numbers of specialists. Even when bolstered by expatriate hires, the number of Rwandan specialists needed is substantial. Table 99 provides the current number of Rwandan and expatriate specialists and the existing gaps.

Table 99. Gap of Rwandan Physicians, by Specialty[30]

Specialty	Rwandans	Expatriates	Total Specialists	Total Specialists Needed*	Rwandan Specialists Needed
Internal Medicine	12	3	15	80	68
Anesthesiology	8	1	9	80	72
Ob/Gyn	19	9	28	80	61
Surgery	6	6	12	80	74
Pediatrics	14	7	21	80	66
FAMCO	0	0	0	40	40
TOTAL	**59**	**26**	**85**	**440**	**381**

*As determined by the MoH in the HRH Strategic Plan, based on socioeconomic factors and disease burden. Does not include 57 'other' specialists and sub-specialists.

Nurses face a similar crisis in capacity. In the past, there have been three levels of training for nurses in Rwanda—A2, A1, and A0. A2 level nurses finish secondary school, A1s attend three years of nursing school and A0 nurses hold a bachelor's degree. The Government of Rwanda ended the A2 level program and plans to upgrade all A2 nurses to A1. However, the majority of nurses in Rwanda are still A2 level. See Table 100 for the number of nurses in Rwanda, by level.

Table 100. Number of nurses, by level

Level	Number	%
A0	104	2%
A1	797	11%
A2	6,069	87%
TOTAL	**6,970**	100%

A1 nurses represent less than 10% of the total pool of nurses, many of whom live in Kigali and work in the referral hospitals. The Ministry of Health intends for A1 nurses to run health centers in Rwanda but there is currently a severe shortage which means that health centers are typically staffed by A2s. There is also an insufficient number of A0 nurses as faculty of the nursing schools. This means that there are not enough highly trained nurses to train nursing students and that most of the directors of the nursing schools are A1 level.

C. Insufficient equipment and infrastructure

High quality healthcare is not only dependent upon the health workers, but also upon the infrastructure and equipment available to them. Most health workers in Rwanda do not have the tools they need to provide high quality care. Where equipment is present, it is often poorly maintained and therefore nonfunctional for extended periods of time.

[30] MOH (2011).

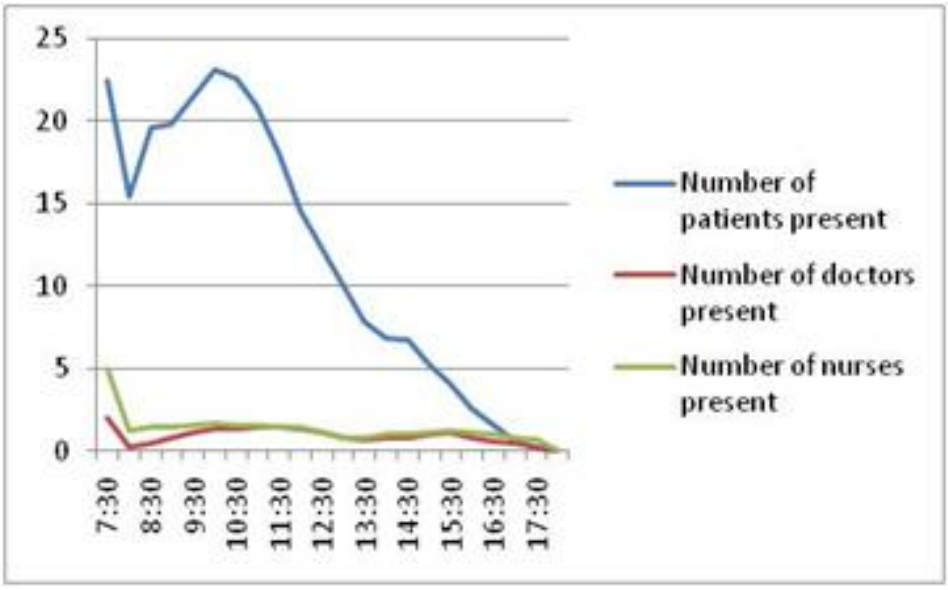
D. Lack of health management training

With the exception of King Faisal Hospital, all of the referral and district hospitals are headed by a director who is also a medical officer with clinical responsibilities. However, a high functioning health system requires directors who have formal training in health management.

Several analyses of hospital and health center management show that health management systems at all levels needs improvement. Clinicians are typically appointed as directors due to seniority and ability in the clinical arena and have received little or no training in hospital administration. Similarly, only 7 out of 30 officers of the District Health Units have completed or in the process of completing a masters degree in public health or health management.

Limited management capacity adversely impacts the quality of patient care. As shown in Figure 16, the timing of shifts for doctors and nurses is not optimally timed with patient load. This means that staff are overburdened which can lead to delay of much needed care and treatment for patients, rushed consultations with a higher potential for error, and fatigue or burnout on the part of health workers.

Figure 16. District Hospital Outpatient Patient Load and Staffing[31]



Training in hospital management is also important for effective procurement and oversight of supplies. Hospitals require large and varied quantities of consumables. Ensuring that products are available when and where they are needed requires advanced skills. Physicians in Rwanda are often forced to perform procedures without the supplies they need, making do with inadequate replacements and at risk for delivering suboptimal care.

[31] MOH and CHAI (2011a).

Rwanda HRH Policies

Appendix 16

Appendix 16. Rwanda HRH Policies

The HRH Program is based on key national policies and goals including:

1) Rwanda Aid Policy, 2006
2) Health Sector Strategic Plan, 2009-2012 (HSSP-II)
3) Human Resources for Health Strategic Plan, 2012-2016

The key components of these policies and goals are summarized below.

I. Rwanda Aid Policy, 2006

Rwanda is committed to increasing the effectiveness of the assistance it receives. It is intended that the present document will act as a strong foundation for improvements, on the part of both government and development partners. The objectives of the policy are to:

- Create operational development strategies to align donor funds with government priorities and link sectorial and different administrative levels
- Strengthen reliable country systems including financial management, procurement, and reporting systems
- Align aid flows with national strategies
- Strengthen local capacities by focusing technical assistance on knowledge transfer
- Use country financial management and procurement systems to channel all aid
- Avoid parallel project implementation units
- Improve the predictability of aid so that it is disbursed as scheduled
- Aid is untied and not politicized
- Use of common arrangements to deliver aid through sector-wide approaches
- Joint missions and analytical work between donors
- Results oriented frameworks with commonly defined performance indicators
- Mutual accountability of donor and country implementer with an independent monitoring mechanism

The Government of Rwanda recognizes the importance of increasing the effectiveness of current aid, while also increasing the amount of aid in order to reach medium term development goals on the road to self-sufficiency. Country ownership is the primary guiding principle of aid in Rwanda. In light of these values, the policy outlines the process and responsible parties in the mobilization and administration of aid resources.

II. Health Sector Strategic Plan 2009-2012 (HSSP-II)

Program areas of the HSSP-II have been categorized along two axes to reflect the revised focus of the health sector: client-centered service delivery and support services. Client-centered service delivery contains all objectives and outputs directly related to improving the health of the people. This axis includes four main components or programs: (i) all services related to family planning, maternal and child health, reproductive health and nutrition; (ii) all services related to prevention; (iii) all services related to treatment.

The system-focused components contain objectives and outputs that provide an enabling environment for service delivery to be optimally effective and efficient. These components all relate to health system

strengthening. This axis includes 8 components: Planning and Monitoring and Evaluation (M&E), Health Financing, HRH (including basic and in-service Training), Infrastructure, Equipment and Transport, Commodities Supply and Logistics (including Pharmaceuticals), Quality Assurance, Research, Governance.

HSSP-II builds on its predecessor, including the scaling up of initiatives developed during the lifetime of HSSP-I. It also contains new initiatives, which include:

- *Performance-based financing (PBF) scheme,* developed to reward health facilities and staff for good performance (increased utilization and quality of services), emphasizing output financing mechanisms rather than input financing, will be further expanded;
- *Community-based health insurance* scheme will be scaled up even further to ideally ensure coverage for everyone, while looking for more sophisticated and diverse mechanisms to subsidize the premiums for the poor;
- *Community health* interventions, a way of bringing services closer to the people and increasing coverage with basic curative and preventive care, will be further strengthened;
- *Development of the Sector Wide Approach (SWAp);*
- *Decentralization process* that is underway.

III. Human Resources for Health Strategic Plan 2011-2016

The overall aim of the HRH Strategic Plan is to increase the number of appropriately skilled, motivated and equitably distributed health service providers for Rwanda. The main strategic objectives of the plan are:

A coordinated approach to planning across the sector based on the best available data:

1) HRH research and development;
2) Coordination, including Development Partners, with all stakeholders;
3) Establishment of an HR Information System; and
4) Development of M&E systems to track progress of the implementation of HRH Program.

Increased number of trained and equitably distributed staff:

1) Increasing training output;
2) Strengthened in-service training;
3) Increasing numbers of skilled health workers in post; and
4) Improving the deployment and retention of health workers.

Improved productivity and performance of health workers:

1) Improving the quality of Pre-Service training;
2) Improving the quality and cost-effectiveness of In-Service Training;
3) Improving performance management capacity and tools; and
4) Strengthen management and leadership at all levels.

Strengthened human resource planning, management and development systems at all levels:

1) Develop and implement HR policies, plans and strategies;

2) Strengthening the capacity and management of HRM/HRD; and
3) Support existing professional (regulatory) bodies and the creation of others.

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