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**RADIOLOGY-READINESS Program at
RAD-AID International:**

**Assessment of Radiology Services in
Korle Bu Teaching & 37 Military
Hospitals
Accra, Ghana**

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Executive Summary

The Korle Bu Teaching Hospital, located in Accra, Ghana, is the largest premier hospital in Ghana. Surrounded by several health institutions such as AcuMed Clinic, Ridge Hospital, 37 Military Hospital, Police Hospital, La General Hospital, and other polyclinics, Korle-bu is the leading referral center in Ghana and is currently the third largest Hospital in Africa. Korle Bu Teaching Hospital is also one of the leading hospitals in Ghana, and also sub-Saharan Africa, that continues to introduce and provide specialized services, such as radiology, to a significant number of West African citizens including, but not limited to, clientele from Togo, Ivory Coast, Burkina Faso, Tanzania, and Liberia.

Korle Bu currently stands as the health institution that provides medical imaging services to a significant number of Ghanaians and other neighboring West African countries. However, the inadequate number of medical imaging equipment, health imaging workers, and insufficient training has slowly interrupted effective and efficient health delivery process at the hospital. For this particular reason, Dr. Vincent Hewlett, chief radiologist at Korle Bu invited a RAD-AID team to perform a thorough assessment of the radiology services at Korle Bu from March 26, 2012 to April 10, 2012. Seth Kwabena Quansah, a RAD-AID Global Health Fellow, was commissioned to conduct this assessment in Ghana as an initial effort to understand radiology in Ghana. In addition, Seth Quansah also conducted a radiology assessment on 37 Military Hospital, which is also another large, tertiary referral institution second to Korle Bu Teaching Hospital.

Radiography and radiology services at Korle Bu are limited both qualitatively and quantitatively. Many of the medical imaging equipment are outdated, malfunctioning, and idle or require reparation/maintenance. The radiology department at Korle Bu has no PACS, and most equipment use plain film. There is only one functioning mammography and CT for the entire facility that serves more than 25 patients a day. Because of the outdated and poor quality of medical imaging equipment at the Korle Bu Teaching Hospital, advanced technical and post-qualification training are limited among medical imaging workers which ultimately lead to poor understanding of new cases, occasional misinterpretation of protocols, and eventually lack of motivation among these health workers.

The radiology facility at the 37 Military Hospital, on the other hand, has more modern imaging equipment than the Korle Bu Teaching Hospital. Although the imaging equipment are available at 37 Military Hospital, they do not have imaging equipment for the nuclear

medicine department such as PET, C-Arm Fluoroscopy, SPECT Gamma, Non-SPECT Gamma, and Bone Densitometry. However, one of the essential needs at the 37 Military Hospital is the necessity for more training and educational opportunities to utilize the equipment effectively, and to properly interpret protocols.

The radiographers and radiologists expressed need for modern medical imaging equipment as well as educational resources and training to increase their skillset in providing the most effective and efficient form of radiology services at their respective hospital premises. Most of the medical imaging workers are either frustrated with the rigid work flow or they are not motivated in their workplaces. Sometimes, the radiographers are out of work because of non-operational or malfunctioning equipment.

Radiology and radiography services offered at the Korle Bu Teaching Hospital are not optimal to standard protocol because of factors such as outdated and limited number of medical imaging equipment, inadequate training and educational resources for radiographers, technicians, and radiologists. Currently, the MRI equipment at Korle Bu is not in operation because the cooling system in the room has technical problems. The only mammography at the hospital also undergoes periodic reparations because of its overuse. Most of the outdated technologies available at Korle Bu radiology facility make it difficult to find certain parts for reparation or maintenance. Even though safety and quality control are established in the institution, compliance to the safety rules is usually not on par because of factors such as inadequate leaded gloves, and sometimes negligence due to the frustrated or unmotivated health workers.

The radiologists and radiographers at the Korle Bu Teaching Hospital express a strong need for modern and advanced medical imaging equipment to enhance their work performance and healthcare delivery to the demanding populations in sub-Saharan Africa. In addition to modern equipment, the radiology department also expressed the need for more training and educational resources to keep them current in the radiology world. The radiology department at the 37 Military Hospital have better and more modern equipment than the Korle Bu Teaching Hospital; however, the radiographers and radiologists stressed on the need for more technical and post qualification training as well as educational resources to enhance their skillset in order to provide better imaging services to their clients.

Recommendations for improving radiology at the Korle Bu Teaching Hospital relate to the provision of improved and modern medical imaging equipment such as mammography, ultrasound, film radiography, CT scanners etc. In addition, the provision of modern equipment must be accompanied by more technical training and educational resources for technicians, radiographers, and radiologists at the facility. The 37 Military Hospital primarily needs more radiology related educational resources and materials for technicians, radiographers, and radiologists at the hospital premises. In addition, technical studies and post qualification training for technicians, radiographers, and radiologists will help facilitate better radiology services at the 37 Military facility. RAD-AID International's online Learning Management System, one-on-one training with visiting specialists, web conferencing,



medical imaging seminars, and distribution of a cloud-based system for remote image sharing and collaboration might be one effective method of providing adequate education and training for medical imaging workers at the hospital premises in Ghana.

Background

Korle Bu Teaching Hospital (KBTH) is one of Ghana's largest premier hospitals, and is also the third largest hospital in Africa. Korle Bu serves over 500,000 patients each year, mainly from Ghana, but also from other neighboring countries such as Togo, Burkina Faso, Ivory Coast, Nigeria, Liberia, and, sometimes, Tanzania. The 2,000 bed hospital has established itself as the center of quality healthcare and has set the stage for introducing specialized medical services in sub-Saharan Africa. For this reason, Korle Bu strives to offer the best medical care to its clients in Ghana and other parts of West Africa. However, radiology at KBTH is at its fetal stage. The lack of equipment and insufficiently trained medical imaging staff makes it quite difficult for the radiology department to offer its best services to the populations. As part of efforts to address this pending problem, the chief radiologist at Korle Bu radiology department, Dr. Vincent Hewlett, invited a RAD-AID team to perform a thorough assessment of its radiology department from March 26, 2012 to April 3, 2012. Seth Kwabena Quansah was commissioned by RAD-AID to perform this assessment at Korle Bu Teaching Hospital. Quansah also conducted a radiology readiness assessment at the 37 Military Hospital. The 37 Military Hospital is a public, tertiary referral center located in Accra, Ghana. Surrounded by other health institutions such as Ridge Hospital, Police Hospital, La General Hospital, and Mamobi Polyclinic, the 37 Military Hospital serves over 250,000 patients each year. Radiology at the 37 Military Hospital is more deficient in skillset and technical training than in medical imaging equipment. This health institution has newer and more advanced equipment than Korle Bu Teaching Hospital although KBTH attends to more clientele per year than the 37 Military Hospital. The following is a summary of Quansah's findings and recommendations.

I. Radiology Departments

Physical Structure and Characteristics

Korle Bu Teaching Hospital (KBTH)

The Korle Bu Teaching Hospital stretches over a 4 square kilometers space but less than 1% of this area is devoted to the radiology department. The facility is constructed with blocks with plaster, wood, stone, and lead shielding used in the walls. The radiology department has concrete flooring and contains frames made out of steel, wood, and or stone. Power supplies are sometimes stable because of its erratic nature. The radiology facility has no voltage stabilizers but has a 25 kVA output generator powered by gasoline. Average yearly temperature at the facility ranges from 25 to 34 degrees Celsius. The facility has air-conditioning some of the time but has no heating or dehumidification systems in place. The facility reported problems with condensation and dust on walls and or equipment at some time during the year.

37 Military Hospital

The 37 Military Hospital covers about a 90,000 square meters area while approximately 5% of this area is dedicated to the radiology department. The radiology department is mainly constructed with concrete flooring with walls consisting of lead shielding, sheet rock, plaster, wood, and stone. The frames are made out of either steel, wood, or stone. Power supply is sometimes stable but the facility has backup generators, powered by gasoline, which has about 11 kW output power. The electronic devices at the 37 Military Hospital are connected to voltage stabilizers, and always has air-conditioning in the facility. Unlike KBTH, the facility reported no problems with water condensation and dust accumulation on walls and or equipment. Average annual low and high temperature range between 27 and 34 degree Celsius respectively. The facility, however, has short supply of an intact, functional plumbing system for automatic distribution of water around the facility.

Imaging Equipment

Korle Bu Teaching Hospital (KBTH)

KBTH has a total of 10 film radiography equipment currently with only 3 in operation. Only three out of the 8 film developers are functioning at the Korle Bu Hospital. The facility has one non-functioning computed radiography (CR), and no direct digital radiography (dDR). The only mammography unit undergoes several reparations and maintenance due to its ancient technology and its inability to cope with heavy workload. The hospital has a total of 2 CT scans (2 slice); however, only one is functioning properly. The other CT scan lie idle because it was disassembled for construction purposes. It still remains disassembled due to poor technical skills to put the different parts together, and is currently placed in the radiology department's store room. KBTH also has a functioning 1.5 Tesla MRI unit; 2 ultrasounds; 1 standard fluoroscopy; 1 C-Arm/Angiography Fluoroscopy unit; and 1 SPECT gamma. The facility also contains one non-operational non-SPECT gamma. All medical imaging equipment (except those at the nuclear medicine department e.g. SPECT Gamma) at KBTH are non-digital and operate in the analog system. Hence KBTH has no PACS at the radiology facility.

37 Military Hospital

Most of the medical imaging equipment in this health institution are quite modern and function properly. For instance, the Korle Bu Teaching Hospital has CT scanners that come with 2 slices whereas 37 Military Hospital has a 16 slice CT scanner. The facility has only one film radiography; one film developer; one computed radiography (CR); one direct digital radiography (dDR); one ultrasound; one 1.5 Tesla MRI unit; one standard fluoroscopy. The only non-operational equipment in this facility is the mammography. 37 Military Hospital has no nuclear medicine equipment such as PET, SPECT gamma, non-SPECT gamma or Bone Densitometry. The facility reported only one film radiography that serves over 100 patients a day. All imaging equipment at the 37 Military radiology facility have PACS.

Human Resources and Education

Korle Bu Teaching Hospital (KBTH)

KBTH has between 5 and 10 radiologists although none of them have training in a specialty or fellowship. Although there are more than 10 radiographers in the hospital, the skillset is limited to ancient technologies and limited understanding of radiology. Since most of the medical imaging equipment remains non-operational, most technicians and radiographers remain out of work and are, often times, not motivated in the facility. The number of medical imaging workers might seem adequate for Korle Bu; however, the numbers are inadequate due to the lack of equipment in the radiology department. The radiographers and technicians have no access to continuing radiology education, and other related materials in the hospital.

37 Military Hospital

The 37 Military Hospital contains just a handful of radiologists and radiographers in their department. The radiology department of this health institution is understaffed for radiologists, technologists, sonographers, radiology nurses, and orthopedic surgeons. Most of these medical imaging workers have experience and knowledge limited to their learning experiences in medical school or residency programs. Even though some of the radiologists in this facility reported fellowship training, further educational resources and continuing medical education are a huge concern for this health institution. The need for further training of radiologists, radiographers, and technologists are a major problem for the 37 Military radiology department, and primarily the most concern particular to their facility.

Technology and Communication

Korle Bu Teaching Hospital (KBTH)

Information technology at KBTH is at its basic level. The radiology facility has access to internet, e-mail, word processing, electronic presentation capabilities, and digital radiology viewing workstations. The facility does not have general-use computer workstations for staff, electronic file sharing, electronic medical record system, radiology information system, health management information systems, web conferencing, teleradiology or PACS. Cellular phone services are usually the best forms of communication because it is more reliable, easier to use, ubiquitous among health workers, and affordable for international calls. The internet service at the KBTH runs at 100 Mbps, and is currently not optimal for operations at the facility.

37 Military Hospital

The 37 Military Hospital has better and more advanced technology than KBTH. The radiology facility has general-use computer workstations, e-mail, word processing, electronic presentations; electronic medical record system backed up on hard disks, health management information system, digital radiology image viewing workstations, and PACS. The facility, however, does not have teleradiology, web conferencing, radiology information

system, and electronic file sharing. Cellular phone services are optimal forms of communication at the facility because it is easily accessible, affordable, and is a better way for international phone calls. Internet service at the facility runs on 512 Mbps, usually available yet with frequent interruptions.

Radiology Room and Darkroom

Both the Korle Bu Teaching and 37 Military Hospitals have a nicely arranged room for both patients and medical imaging workers, although there could be more room for improvements. One noticeable flaw in these rooms was the space available. Some of the rooms seem to be more occupied than it should be, although it did not seem to be a major concern for the medical imaging workers during the visit.

Radiation Safety and Patient Care

Both the Korle Bu Teaching Hospital and the 37 Military Hospitals have standard radiation safety and patient care established under a radiation protection or safety institute. According to the study and assessment responses, these safety measures are monitored fairly consistently. Occasionally, the lack of certain safety equipment such as lack of leaded gloves (in the case of Korle Bu Teaching Hospital) and workers' negligence due to lack of motivation may lead to poor observation of such safety measures.

II. Challenges in Radiology

Korle Bu Teaching Hospital (KBTH)

Lack of Equipment

KBTH greatly suffers from lack of modern medical imaging equipment such as film radiography, CT scanners, and mammography. Most, if not all, of the imaging equipment are not digital and do not have PACS. These outdated equipment make it difficult to repair because some of their parts are currently off the market. These machines produce low quality images because of its age and overuse. The total study volume for radiography at the facility alone is 100 patients a day; 25 patients a day for CT; 10 patients a day for MRI; 10 patients a day for fluoroscopy; and 6 patients a day for mammography. CT Scanners and MRIs, on occasion when they are malfunctioning or broken, take more than 4 weeks to repair; hence, these services are unavailable for clients during this period. Secondly, the cost of repair for these equipment are quite expensive. The facility reported between \$50,000 and \$70,000 for the cost of repairs and maintenance. Other equipment such as the non-SPECT Gamma is very old, and currently not in use.

Lack of Expertise

Radiographers, technicians, and radiologists at KBTH were found to be mostly idle or unmotivated to perform their duties and responsibilities at the facility. Working conditions for these imaging workers are not at their best. Continuing medical education is rarely accessible to radiologists and radiographers. Most radiographers were reported to defray from such training because of the costs of education. Although local and national conferences are available, they are limited. Also imaging workers rarely or never attend international conferences or meetings. The need for more books and educational resources is very scarce for two reasons:

- a. Most of the books are costly and usually only one copy is bought for an entire radiology department
- b. Most of the books are not sold in Ghana or neighboring countries. Usually, these books are bought overseas (e.g. United Kingdom) which sometimes makes it very cumbersome and time consuming individuals or the department.

The reasons discussed above leave imaging workers at KBTH hopeless, frustrated, and sometimes unmotivated to work to the best of their abilities. The facility also lacks training opportunities for radiation safety officers and medical physicists, which might be detrimental to the safety and welfare of the medical imaging workers at KBTH.

37 Military Hospital

Lack of Expertise

The 37 Military Hospital has a need for further technical and post qualification training at their facility. Upon the visit, one of their circulating comments was the need for further educational resources and training for the radiographers and radiologists. The facility rarely or never has access to continuing medical educational resources; training is accessible but limited; paper journals are either limited or never available; and international meetings/conferences are accessible yet limited because it is difficult for the imaging staff to obtain sponsorship from the hospital administration. The 37 Military Hospital radiology facility also reported that they do not have a sonographer and other expertise in nuclear medicine.

Lack of Equipment

Although not a primary concern for the radiology facility, the need for more imaging equipment remain on top of the list at the 37 Military Hospital. The facility currently has no functioning mammography because the only one they had remains unrepaired. The facility has one film radiography, one computed radiography (CR), direct digital radiography (DDR), ultrasound, CT, MRI, and fluoroscopy. Total study volume approximated by the facility for radiography is 100 patients per day; 15 patients per day for CT Scanners; 15 patients per day for sonography; 5 patients per day for MRI; and 4 patients per day for fluoroscopy.

III. Discussion and Recommendations

Korle Bu Teaching Hospital (KBTH)

Radiology at KBTH needs significant improvements in both equipment availability and technical training of radiographers and radiologists. KBTH serves a larger population and has several departments so the access to quality radiology might help serve more medical needs comparable to other health institutions in the area. The number of some imaging equipment such as the film radiography or mammography at the facility can be increased to attend more patients who visit the facility at a lesser time period. In addition, modern and updated imaging equipment will produce better images for better interpretation as part of offering better services to clients.

37 Military Hospital

Imaging equipment at the 37 Military Hospital appear to be more modern, and efficient for this particular radiology facility. The only problem is the lack of technical and post qualification training of the radiographers and radiologists at the facility. More one on one training programs, teleradiology, web conferencing with the imaging faculty and staff at the hospital will be optimal to reaching the best healthcare delivery at the facility. In addition, more access to printed journals, current radiology related books, conferences, and workshops will help enrich radiographers and radiologists to better utilize the imaging equipment as efforts to provide the best medical care to their clients.

IV. Conclusion

Radiology Department

With the introduction and increase in industrialization and urbanization, diseases have shifted from communicable illnesses to cardiovascular diseases, cancers, and maternal complications in Ghana. For this reason, it is imperative that medical imaging will be at its optimal level to make significant headway against such diseases. The availability and proper utilization of medical imaging devices will assist in the early diagnoses of such morbidities which will provide early treatment methods to prevent complications and mortalities. The Korle Bu Teaching Hospital and 37 Military Hospital which serve as the major tertiary referral centers in Ghana strive to offer radiology services to Ghanaians as well as other neighboring countries such as Togo, Ivory Coast, Nigeria, and Burkina Faso. The facility at KBTH has concrete flooring, lead shielding in its walls, and a stable building for its radiology department; however, the facility lacks the following:

- a. Voltage stabilizers
- b. Consistent power supply
- c. Constant air-conditioning

The 37 Military Hospital also has a stable building for its radiology facility. The walls contain lead shielding, plaster, and or stone. Unlike KBTH, the facility at 37 Military Hospital has voltage stabilizers and consistent air-conditioning. However, the facility reported short supply of an intact, functional plumbing system for automatic distribution of water around the department.

Challenges

Unfortunately, the radiology departments of both institutions lack the training and also equipment in order to meet the increasing needs of clientele. For instance, the equipment at KBTH are very limited, outdated, and lack modern technology. Most of the equipment require constant reparation and maintenance. Also, the department could use additional equipment to ease the work flow at the facility. With the introduction of new equipment require further training and educational opportunities and resources for radiographers and radiologists to enhance their skillset for better health care provision.

The primary challenge for radiographers and radiologists at the 37 Military Hospital facility is the need for further, more technical and advanced training. Radiology related educational resources, journals, and conferences are rarely accessible for imaging workers at this department. The need for further training and radiology studies will maximize radiographers' and radiologists' potential to interpret protocols and offer the best services at the facility.

Recommendations

KBTH needs more modern and advanced technology and equipment to promote more efficient and effective work flow. The demanding nature of radiology services can easily be met with the provision of cutting-edge radiology technology and equipment. KBTH has significant need for a mammography, CT Scanners, ultrasounds, fluoroscopy, digital-based equipment, as well as PACS. Mobile X-rays equipment will also be beneficial to the radiology facility and the entire hospital as a whole. The introduction of other electronic software applications such as the electronic reporting system, web conferencing, and electronic file sharing will enhance communication and distribution of ideas, knowledge, and connections with other surrounding health facilities. The provision of such equipment must also be accompanied by continuous medical education for radiographers, technicians, and radiologists. Modern books, journals, research, one-on-one training sessions, workshops, and conferences are some effective ways to help improve and increase radiology education for the imaging workers at the KBTH facility. With over 500,000 patients and needs from various parts of sub-Saharan Africa, KBTH has an obligation to offer the best quality service to meet the needs of Ghanaian or perhaps a continent. With the fast-paced growth and development in the West African continent, the need for radiology has rapidly surged among Ghanaians and West African citizens.

The 37 Military Hospital needs a system that provides further technical training and educational opportunities for radiographers and radiologists at its facility. The availability of

one-on-one training, radiology related books, journals, conferences, workshops, and other resources will benefit the facility especially in the enhancement of equipment use and proper interpretation of protocols. The provision of such resources will improve the skillset of imaging workers and eventually help the facility to meet the needs of Ghanaians as well as other sub-Saharan citizens who may seek medical attention at the facility.

Future efforts must focus on how these large hospitals can possibly work with surrounding facilities to help improve radiology in Ghana. This approach will require more radiology readiness assessments of hospitals in the nation of Ghana.