
THE STATUS OF CLINICAL DIAGNOSTIC IMAGING SERVICES IN UGANDA'S REGIONAL REFERRAL HOSPITALS

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Abstract

Background: *Clinical imaging is an essential component of health care which supports and improves the effectiveness of clinical decision-making. Quality care saves lives and resources of both the patient and the health system. However, many developing countries have neglected diagnostics, especially clinical imaging. Non-use of or poor imaging services lead to wrong diagnosis and treatment, unnecessary health expenditures, and poor health outcomes. Regional Referral Hospitals should have good diagnostic imaging services to provide expert care and bridge the continuum of care by stemming the flow of uncomplicated cases from general hospitals to National Referral Hospitals.*

Aim: *To determine the situation of diagnostic imaging services at regional referral hospitals in Uganda.*

Methods: *A descriptive cross-sectional survey of all the nine Regional Referral Hospitals of Uganda was done in 2007. Environmental inspection of the imaging units, process observation and exit interviews with 156 patients present on the day of the visit were done to assess their satisfaction with the imaging services. Staff were also interviewed. However, quality validation of the imaging outputs was not done. Selected health facilities in the capital Kampala were visited to obtain data on patients referred from upcountry. Five-year hospital records were reviewed for outputs.*

Results: *The premises were of poor quality and staff and patients were not safe from radiation exposure. No radiosurveillance measures were operational. The output of imaging services was generally very low, (mean: 16 procedures per day, range: 6 - 22) due to lack of consumable inputs. Only 37% (range: 14 – 64) of approved staff positions were filled. Nurses were insufficient and some cadres lacked altogether. Stock-outs of key consumable inputs were prolonged (ultrasound gel: 90 days) and patients were required to buy their own. Many patients were referred to private services but not recorded. Central level supervision by the Ministry of Health was lacking.*

Conclusion and recommendation: *The quality of imaging services was poor, and could be improved through higher prioritization of imaging services in hospital planning, better financing, better support supervision and establishment of an active radiosurveillance mechanism.*

Introduction

Clinical Imaging is a group of methods used to gain information that aids in a patient's diagnosis, therapy and prognosis (AIM, 2007). It may be classified into diagnostic and therapeutic fields, in which the latter utilizes radiation for treatment of disease (WHO, 2003). This paper focuses on clinical diagnostic imaging services in regional referral hospitals in Uganda.

Clinical diagnostic imaging is a general term applied to nondestructive photographic techniques of investigating the gross internal structure of any object (McGraw-Hill Encyclopedia, 2005). The procedures are diverse and span a wide spectrum ranging from X-ray based examinations to sound, radionuclide and magnet based investigations (AIM, 2007). It is used to

exclude disease, to prove the existence of a pathological process, to assist in the planning of treatment or to follow the course of a disease already diagnosed and/or treated.

Diagnostic imaging services should be developed as an integral part of national health care systems and be planned according to country, region or area needs (WHO, 2004). Medical experts caution that, without imaging to guide diagnosis and treatment, patient safety could be unacceptably compromised and quality of care diminished. For successful clinical diagnostic imaging, the health system requires trained medical, technical and engineering staff, radiation protection measures and regulations, reliable supplies of clean water, electric power, spare parts and consumables and adequate air quality control. Most of these require adequate funding.

Whereas the health systems of most developing countries are generally under-funded, diagnostic services suffer most. This puts the entire quality of care at risk and increases the cost of care as most diagnosis is made basing on presumptions and syndromic approaches. One key reason for under-funding diagnostic services is the fact that the necessary equipment and consumables are not manufactured locally, are not recyclable and are very expensive. The required personnel take long to train and need constant supervision and quality assurance. Due to prolonged under-funding of diagnostic services, their quality (and that of imaging services in particular), has gone down in many countries. For developing countries, diagnostic imaging services include x-ray and ultrasound imaging, although there may be Computed Tomography (CT) scanning and Magnetic Resonance Imaging (MRI) in private clinics, hospitals and National Referral Hospitals. However, due to their high capital, operational and maintenance costs, these additional services will take very long before they can be rolled out to regional and peripheral levels. In any case, the WHO estimates that simple X-ray and ultrasound examination either singly or in combination, are all that is necessary to confirm a diagnosis in approximately two thirds of patients who need diagnostic imaging (WHO, 2007). Therefore, X-ray and ultrasound scanning services should be of very good quality where they exist.

In Uganda, the percentage of public health facilities equipped with diagnostic imaging machines was 73.6% in 2004 (MOH Uganda, 2004) and the national coverage with x-ray and ultrasound machines among private health providers was 8% and 11% respectively (Mandelli et al., 2005). Despite this relatively high national coverage with imaging services, patients continue to flock for imaging care in Kampala (UEPB, 2005; Makerere

Medical School, 2007). It is assumed that this is a reflection of their perception of the quality or the actual quality offered in the peripheral and regional hospitals, since patients tend to vote with their feet. However, the influx leads to congestion of the diagnostic imaging departments in the national referral hospital at Mulago. Congestion affects the quality of care, the timeliness of releasing results, and has led to accusations of corruption in the rationing of imaging services. This study therefore set out to establish the actual situation of diagnostic imaging services in regional referral hospitals, and to see if there are low-cost mechanisms amenable to policy change in which they can be improved.

The study followed Donabedian's model of quality of care analysis, by looking at the structure, process and outcomes (Donabedian, 1980) of diagnostic imaging services available at Uganda's 9 regional referral hospitals. A typical regional referral hospital in Uganda has 330 beds (range: 252 – 448) and serves a region with about 2 million people. It handles about 135,000 outpatients and 18,000 in-patients a year. For structure, we focused on the physical infrastructure, the imaging equipment and accessories, and the staffing levels in the imaging units. For process, we looked at the adherence to radiation safety measures established by Uganda National Radiation Protection Services and the support supervision function. For outcomes, we looked at the utilization rate of the imaging services; the patient referral process; and patient satisfaction with imaging services. For patient referral, we hoped to analyse the functionality of regional hospitals by using the geographical origin of upcountry patients receiving diagnostic imaging care in health facilities around Kampala as a proxy measure. The study focused on data from January 2002 to May 2007, but observations of practice and patient satisfaction surveys were done between May and July 2007.

Methodology

The study was carried out in imaging units of the nine regional referral hospitals which are geographically spread out in Uganda (Arua in the north west, Fort Portal in west, Hoima in the west, Jinja in the south-east, Kabale in the south-west, Lira the north, Masaka in the south, Mbale in the east and Soroti in the east). Two would be units, Gulu in the north and Mbarara in the south, were excluded after having been recently elevated to national referral level. Mulago national referral hospital and the large private general hospitals of Kibuli, Mengo, Nsambya and Rubaga were studied, together with two large clinics with prominent diagnostic imaging services, Kadic and Kampala Imaging Centre, to track patients originating from the periphery of the country.

A descriptive cross-sectional study was done, collecting both qualitative and quantitative data. The respondents were the patients who had come to receive imaging care on the day of the visit. We also interviewed other clinical staff (nurses, clinical officers etc) and support staff working in the imaging departments, and the radiologists, radiographers, darkroom attendants and the Medical Superintendents or hospital administrators. A total of 156 patients, 48 clinical staff, 30 technical imaging staff, 2 Medical superintendents, 10 hospital administrators, 2 doctors in charge of research in the hospital and 4 store keepers.

We reviewed documents, especially requisition books to obtain an idea about the supply of consumables, and patient registers for records of patient numbers, areas of origin and referrals. We inspected the buildings to assess their design, maintenance and accessibility. We inspected the equipment present and assessed its functionality, presence of operational manuals and reference books for the different diagnostic procedures. We also assessed the radiation protection measures and the type and condition of the accessories in use.

We conducted patient exit interviews asked them about their satisfaction with ease of access and comfort in the unit, their perception of the hygiene, the quality of the reception, waiting time, availability of consumables, privacy, respect and explanation of procedures before, during and after the investigation.

For support supervision, we assessed the frequency and type of supervision received/done during the five years under study. We checked the records for referred cases over the five years, and if there was any feedback received on referrals, the nature of cases referred and the hospitals to which referrals were made.

For adherence to radiation safety measures, we assessed the frequency of radiation monitoring per year, availability of dose results, presence of Thermoluminescent Dosimeters (TLD) on the imaging staff, presence of exposure charts, radiation warning signs, use of protective wear, quality of the shielding, imaging distance, and time taken per radiation exposure.

For the origin of patients in the Kampala-based clinics and hospitals, we looked for patients from outside Kampala city who were self-referrals, or referred from regional referral hospitals. We captured the referring hospital and the nature of cases referred. We used trained records assistants to search for the origins of the patients in the registers. Both quantitative and qualitative data were eventually entered and analysed using Microsoft Excel Office 2003. The study did not

have major ethical issues since human subjects were not a focus of the study. It was approved by the Ethical Review Board of the Faculty of Health Sciences of Uganda Martyrs University, and all respondents gave verbal informed consent after detailed explanation of its purpose, potential use, risks and benefits. To preserve anonymity and enhance confidentiality, the results are rendered anonymous by renaming using of numbers from 1 – 9. The numbers are randomly allocated and have no bearing whatsoever to their names or quality of care. Any direct imputation of the name behind the number will be accidental although individual managers and staff may identify their own hospital if they are familiar with their data. However, they may not recognize any other hospital.

Study limitations

The main limiting factor of this study was the poor quality of diagnostic imaging records available in the hospitals. Where data were incomplete, we interviewed staff working in the unit to obtain a general idea. However, some key respondents did not have adequate knowledge because they were still new in the units and we had to rely on previous reports compiled by their predecessors. Language barriers for communication with the patients were overcome through the use of hospital staff from outside the imaging departments as interpreters.

Findings

Scope of services

Sonography and general radiography were the main imaging services available in all the units. None of the hospitals had the capacity for theater imaging. Ward imaging was possible in only two hospitals (Hospitals 1 and 3), while interventional radiology was done in Hospital 1 alone. The reasons for not carrying out mobile imaging on the wards and theaters were either due to lack of paved paths between the departments or due to the eroded and rough surfaces which the equipment could not traverse. Contrast imaging was done in only four hospitals (Hospitals 1, 3, 4 and 6). Other units used only blind contrast procedures. Interventional and contrast studies were not performed in other units due to lack of radiologists, instrument sets or contrast media. In some units patients had to, personally, meet the cost of contrast media for the procedures. Only the imaging unit in Hospital 1 had the full set of instruments required for its services. In all the other hospitals, the imaging units had to borrow most equipment from the wards every time they needed to perform a procedure. This caused delays and often led to referral or self-referral of patients.

Aids to imaging techniques

Standard anatomical markers used for indicating the patients' aspect under investigation were present only in Hospitals 1 and 6. The rest of the units use improvised anatomical markers, yet a pair costs about US\$5.0 in Uganda. On average, each hospital had one waiting cubicle which served for both sexes, yet they had long queues of patients and some procedures took long. This was a big inconvenience during peak turn-over hours. Apart from Hospital 1, the rest did not have reference books to be consulted by the staff. Consequently, the imaging staff relied on the knowledge acquired during training or simply referred the patients if they were not confident enough to handle the cases.

Eight of the nine units had wall-mounted film viewers. However, they all lacked pattern-recognition books and automatic film viewers for image interpretation. As a result, image interpretation depended upon the level of expertise and experience of the interpreter.

Availability of supplies and consumables

At the time of the study, two hospitals (Hospitals 1 and 7) had no x-ray films in stock, while four hospitals (Hospitals 1, 2, 3 and 9) had no x-ray contrast media. Three hospitals (Hospitals 4, 5 and 8) did not have Sonopaper for ultrasound recording in stock. Consequently, patients received verbal and written ultrasound scanning results without the images attached for alternative interpretation. Whereas all the nine units had sufficient coupling gel in stock, three hospitals (Hospitals 1, 5 and 7) had no material to wipe the gel off the patients or off the equipment in between patients. This forced the patients to purchase their own material, in most cases a roll of toilet paper.

Procurement and storage of imaging supplies

The main sources of imaging consumables and accessories were either the National Medical Stores or Joint Medical Stores in Kampala. However, deliveries were not timely and led to frequent stock-outs. Over the period under study, the shortest stock-out period for coupling gel we observed was three weeks and the longest was three months. Lack of financial resources was the reason given for the longest stock-out period, while procedural delays and under-procurement were given for the shorter periods. During the periods of financial shortage, priority was given to the purchase of medicines.

Only five hospitals (Hospitals 1, 3, 7, 8 and 9) had proper store-keeping procedures for the consumable supplies, which is essential to monitor consumption and to preserve quality. This could have affected the procurement capacity of the rest. Routine maintenance of the accessories was excellent across all the units.

Process

Lead wears were upheld well while cassettes, hangers plus processors were cleaned regularly. For the equipment, tidiness varied amongst units. Daily cleanliness of equipment was absent in Hospital 3, Hospital 1, Hospital 8 and Hospital 2 despite abundant running water. Stains were clearly visible on equipment and work on patients continued without any sense of remorse.

Total output of imaging services in five years

A total of 187,284 imaging procedures were done in all the nine Regional Referral Hospitals in five years studied. Hospital 1 had the highest number of procedures done daily.

Table 1: Output of imaging services in Ugandan Regional Hospitals, January 2002 - December 2006

HOSPITAL	Total 5-year output	Average Annual Output	Average Monthly output	Average Daily output (22 days/month, rounded off)
Hospital 1	32,289	6,457.8	538.2	24
Hospital 9	28,529	5,705.8	475.5	22
Hospital 3	27,264	5,452.8	454.4	21
Hospital 2	21,656	4,331.2	360.9	16
Hospital 8	20,716	4,143.2	345.3	16
Hospital 5	20,119	4,023.8	335.3	15
Hospital 7	18,125	3,625.0	302.1	14
Hospital 4	11,318	2,263.6	188.6	9
Hospital 6	7,268	1,453.6	121.1	6
	187,284	37,456.8	3,121.4	142

The services offered were: 139,494 radiographic examinations, 47,665 Ultrasound investigations and 125 contrast examinations. Hospital 6 had the least radiographic examinations while Hospital 7 did most of the contrast and ultrasound examinations.

The premises of the Diagnostic Imaging Services

All the units had concrete or brick walls, although in one unit, the building was badly in need of re-plastering. The drainage, lighting and water systems in all the units functioned properly. In four units, the ventilation was inadequate. Staff had to leave the windows and doors open to supplement the ventilation. Only the units in Hospitals 1, 2 and 4 had functional communication facilities with other hospital departments like intercom. Overall, the amount of space allocated for diagnostic imaging was inadequate for the activities taking place. There was a subjective sense of congestion in all the units visited. Although the buildings were marked as "X-ray Department" in all the units, none of the

hospitals had a signpost in the compound indicating directions to imaging units. Visitors and patients were either directed or physically taken to the imaging units by clinical staff. Direct and immediate access to the imaging unit by ambulance was possible only in three hospitals (i.e. Hospitals 1, 5 and 8).

The darkrooms

Three darkrooms were in very bad condition and required urgent renovation. They did not have sufficient ventilation, which is necessary to prevent a rise in the temperature of the chemical processors and to maintain optimal humidity for the safety of the staff. In all the hospitals, the inner walls of the darkrooms were painted black, which is contrary to standard colours for darkrooms in the modern era. Only the darkrooms in Hospitals 4, 5, 7 and 8 were suitably located to prevent boxes of unused x-ray films, exposed film undergoing manual processing and the darkroom attendants from radiation exposure. The rest were all at risk of radiation exposure.

Availability of imaging equipment

The diagnostic imaging equipment recommended by MOH for regional level hospitals in Uganda includes x-ray generating apparatus; duo-diagnostic; fluoroscopy; three-phase radiography system; mobile / portable x-ray and ultrasound machines. The study looked for their presence, functionality and utilization.

Concurrent Duo-diagnostic, fluoroscopy and a three phase radiographic system were only possible in one hospital (Hospital 4). The rest of the findings are shown in Table 2.

Table 2: Functioning diagnostic imaging equipment by type in imaging units in Ugandan Regional Referral Hospitals, 2007

	Duo Diagnostic	Fluoroscopy	Radiography (3Phase)	Mobile	Ultrasound	CT	MRI	PET / SPET
Hospital 9	1	0	0	1	1	0	0	0
Hospital 7	0	0	0	0	2	0	0	0
Hospital 5	0	0	0	1	1	0	0	0
Hospital 3	1	0	0	0	1	0	0	0
Hospital 1	1	0	0	1	1	0	0	0
Hospital 8	0	0	1	0	2	0	0	0
Hospital 6	1	0	0	1	1	0	0	0
Hospital 4	1	0	1	1	2	0	0	0
Hospital 2	0	0	1	0	1	0	0	0

Broken down equipment awaiting repair was found in some hospitals. These included a three phase radiography system (in Hospitals 1, 7 and 8) a mobile x-ray machine (in Hospital 3) and an ultrasound machine (in Hospital 2). These could have been repaired locally, but due to lack of maintenance technicians and spare parts, they lay wasted.

Imaging accessories

Two hospitals (Hospitals 2 and 5) lacked automatic processors and driers, and depended on open air drying techniques, leading to prolonged waiting time. Two hospitals (Hospitals 7 and 9) had no loading benches in the darkrooms. Three hospitals (Hospitals 5, 7 and 8) had poor safelight filters, thus requiring staff to load and unload x-ray cassettes in complete darkness all day long. Majority of the units (except Hospitals 4 and 6) lacked hatches to facilitate the flow of exposed and unexposed cassettes between the examination room and the darkroom.

Processing accessories

Most of the units had no radiographic processing accessories as shown in Table 3.

Table 3: Radiographic Image processing accessories in RRHs

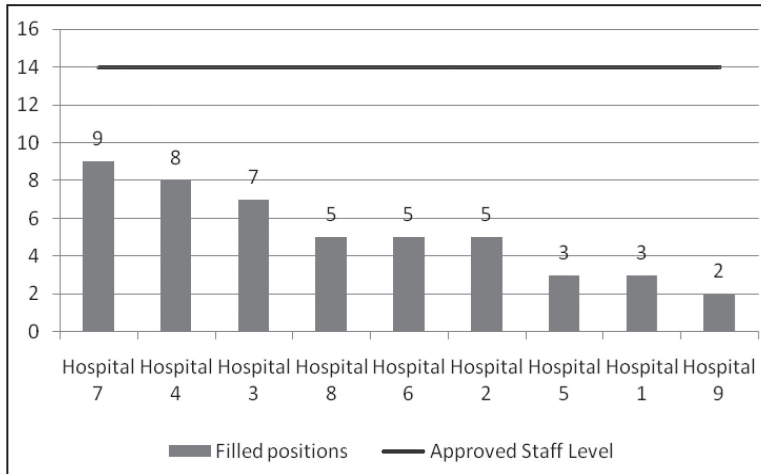
	Name Printer	Film Cutter	Heater	Thermometers	Processing clock	Developing chart	Drier
Hospital 9	0	0	0	1	1	0	0
Hospital 7	0	0	0	0	0	0	1
Hospital 5	0	1	0	0	0	0	0
Hospital 3	1	0	1	1	0	0	1
Hospital 1	1	1	0	1	0	0	2
Hospital 8	1	0	0	0	0	0	1
Hospital 6	1	0	1	0	0	0	1
Hospital 4	0	1	0	0	0	0	1
Hospital 2	1	1	0	0	0	0	0

Hospital 1 was the most facilitated with processing accessories and the least were Hospitals 5 and 7. Most units had only name printers and film driers. Film cassettes and hangers were in short supply in all units. Most units had only 2 cassettes and no hangers at all, apart from one hospital (Hospital 9) which had 67 cassettes and 35 hangers, which is also much higher than what would be expected in a regional referral hospital.

The Staffing Levels

The imaging units were significantly understaffed vis-à-vis the levels approved by the Ministry of Health as shown in Fig. 1

Figure 1: Staffing levels of imaging units in Ugandan Regional Hospitals, 2007



For an approved staffing level of 14 per unit, the staff shortages ranged from 5 to 12, the worst being in Hospital 9. The staff cadres lacking most were those of Sonologists and Medical Physicists, where there was nobody at Regional Referral Hospital level, followed by that of nurses. Sonologist and Medical Physicist positions were reportedly impossible to fill now and in the foreseeable future because there was no ongoing training for them in the country. Uganda had less than ten of each and they were all based at the national hospital in Mulago. The cadres found on the ground vis-à-vis the approved positions were Consultant Radiologists (55.6%); Medical Officer Special Grade - Radiologists (66.7%); Principal Radiographers (88.9%); Senior Radiographers (44.4%), Basic Radiographers (33.3%); Sonographers (50%); Darkroom Attendants (22.2%) and Nurses (11.1%).

Continuing Professional Development

Internal Continuing Professional Development (CPD) for imaging units was carried out only in four hospitals (Hospitals 3, 5, 7 and 9). Other staff attended short courses outside the hospital except those of Hospitals 1, 2 and 7, reportedly due to lack of funds.

Staff satisfaction

Most staff reported to be satisfied with their work environment. The only common complaint raised was the shortage of accommodation. They had to pay for themselves. In Hospital 1, an extra allowance obtained from user-fees was given to the staff to help them alleviate their accommodation costs.

Addressing Patient Satisfaction

Most units were accessible to clients from Monday to Friday from 8.00 a.m. to 5.00 p.m. and some offered a limited weekend service. The sonographic and x-ray results were given to the patients shortly after the procedures. The average time taken during investigations was short, ranging from 15 to 45 minutes for sonographic investigations, 10 to 45 minutes for radiographic examinations. However, contrast studies took 25 to 180 minutes. The variation in the imaging time depended on the adequacy of patient preparation for the investigation, availability of automatic processor, and consistency of electricity supply.

However, other aspects that make patients comfortable in the imaging services were not well addressed. The furniture available was insufficient to make the patients comfortable during the imaging. All the units had no mattresses or pillows on radiographic examination tables. Four units

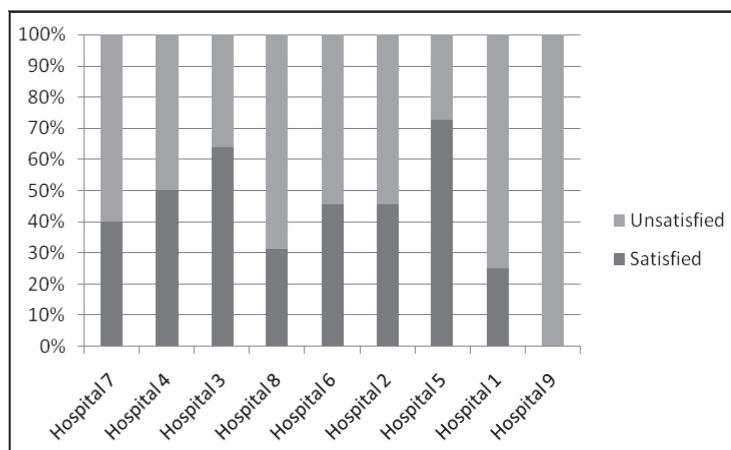
had no toilet facilities for the patients. Only Hospital 7 had a designated waiting area for patients. There were no entertainment facilities in the waiting area. Results were presented to the recipients without explanation and not in envelopes. The recipients were simply asked to deliver the results to the ordering clinician. Imaging staffs did not wear clinical uniform and were indistinguishable from support staff.

As a result, some patients were satisfied with the imaging service while others were not. We interviewed 156 patients for their satisfaction. Of these, 41% was satisfied and 59% were not satisfied with the imaging services at the time of study. The key reasons for patient satisfaction were the availability of staff, good reception and quick delivery of the results. The key reasons for dissatisfaction were lack of a 24-hour service, frequent referral due to lack of consumables, late reporting for duty by the staff, lack of explanation of imaging findings, lack of written results for radiographs, lack of toilet facilities and charging extra fees for consumables like toilet paper.

Support Supervision for Diagnostic Imaging Care

Support supervision was categorized as internal, external and outwards (done by the regional hospital to lower level units). Staff reported that internal supervision was an on-going activity carried out daily by the heads of department. They also reported that they receive monthly supervision by the hospital management. Hospitals 1 and 4 conducted outward supervision to lower levels regularly on a monthly basis. However, external supervision from the Ministry of Health was

Figure 2: Patient satisfaction with imaging care at Ugandan Regional Referral Hospitals, June 2007



not regular. Verbal reports and records showed that in the preceding five years, external supervision to the imaging units had been received place only once in each of Hospitals 4 and 9. Staff at hospitals other than 1 and 4 did not do support supervision to lower levels due to lack of transport or ignorance of this responsibility.

Referral of Patients for Diagnostic Imaging Care

The study found that all hospitals referred patients for advanced diagnostic imaging and interpretation of results to the National Referral Hospital at Mulago. They also referred some cases to private hospitals and imaging centres in their region. However, there were no records of referrals. Verbal reports showed that the main indications for referral to Mulago were CT scanning, Nuclear Medicine, Interventional Radiology, Mammography and Doppler Ultrasound scanning. This was due to lack of equipment and expertise in the regional hospitals. Referrals to private facilities were mainly for special investigations, general radiography and general ultrasound cases. They were mainly due to stock-outs of consumables and sometimes the absence of the technical staff.

Adherence to Radiation Safety Measures

No hospital had all the basic Personal Protective Equipment (PPE) for safety against radiation. Gonad shields and Thyroid shields were absent in all the hospitals. Hospital 5 had none of the basic PPE while Hospital 6 was the best equipped of them all, as shown in Table 4.

All the units had other protective shielding except in Hospital 7. The doors of the radiographic examination rooms in Hospitals 2, 5, 7 and 8 were not lead-lined. Indicator lights on door tops to warn of the danger of exposure were present only in Hospitals 1, 2, 4 and 9. The bucky systems in use in all the hospitals were the erect type, which were poorly installed (except in Hospital 4), predisposing the films and personnel to exposure.

Radiation exposure monitoring

Whereas regular periodic monitoring of the premises, equipment, personnel and environment for levels of radiation is mandatory, we found that personnel monitoring was only in three hospitals (Hospitals 2, 5 and 8). In those hospitals, it was done regularly at intervals of three months, in line with the standards set by National Radiation Protection Services. However, monitoring of the equipment and the environment against radiation leakage was not done in all the units. The reasons given for the failure to do radiation monitoring included lack of transport facilitation for processing the TLDs in Kampala and ignorance of the hospital management about this requirement.

The Origin of Patients Receiving Diagnostic Imaging Care in Selected Health Facilities in Kampala

There was general rise of upcountry patients seeking imaging services in the selected six health facilities in Kampala from 2002 to 2006. The highest number per

Table 4: Presence of selected basic radiation Personal Protective Equipment in imaging units of Ugandan Regional Referral Hospitals, June 2007

	Radiation safety wear (1 = present; blank = absent)							
	Lead cap	Lead goggles	Lead apron	Lead skirt	Lead boots	Thyroid shield	Gonad shield	Lead gloves
Hospital 9			1	1				1
Hospital 7			1					1
Hospital 5								
Hospital 3			1					1
Hospital 1			1	1				1
Hospital 8			1					
Hospital 6	1		1	1				1
Hospital 4			1					
Hospital 2		1	1		1			1

year went to KADIC Hospital, which is a specialist imaging unit. A total of 597,464 diagnostic imaging procedures had been conducted in the selected health facilities from 2002 to 2006. Of these, 142,997 (23.9%) were done on patients who came from upcountry areas outside Kampala. From January 2007 to July 2007 alone, a total of 11,819 procedures had already been done on upcountry patients. However, it was difficult to disaggregate the patients into “referred” and “self-referred” categories because the records in the Kampala-based health units did not show this status.

Discussion

The utilization rate of imaging services is dependent on the availability and adequacy of inputs such as staff, equipment and consumables. This study showed that the units which had prolonged or frequent stock-outs of consumables or those which were poorly staffed, had lower utilization. Where the problem was lack of funds to purchase the consumables, the cost was deflected to the patients thus constituting a further barrier to access. A common practice was to prioritise the purchase of medicines and yet they are only required after proper diagnosis. It is likely, therefore, that the patients receive medicines or undergo surgery for inappropriate conditions due to poor diagnostic capacity. This wastes resources and subjects the patients to unnecessary risks.

The infrastructure in most of the imaging units was inadequate for the current level of activities. This reflects the fact that most of the hospitals under study were constructed in the 1930s as district hospitals, and only upgraded to regional status in the 1990s. However, the upgrading did not bring with it additional infrastructure. Yet, the population of the country has quadrupled since their construction, the morbidity pattern has changed, with a lot of TB and other conditions which require diagnostic imaging. In addition, the pattern of health care demand has changed and more patients know the importance of attending hospital, and the practice of medicine has also changed significantly with a strong inclination towards the increased use of diagnostic services. It behoves the health system, therefore, to ensure that the growth in healthcare infrastructure matches with all these changes. Health workers, even if available in sufficient numbers, of the right mix and with adequate competencies, would not produce the desired impact without adequately planned, built, equipped, supplied and managed facilities (Kurowski et al., October 2005).

Ogembo and Ogara (2004) found that in South Africa, growing demand for more and better health care leads to expansion of the infrastructure. As a result, nearly all the sonographic investigations are currently performed

in rooms formerly designated as offices for the heads of the units. In this study, new equipment was found kept in stores for lack of space to operate it. An earlier study (World Bank, 1994) had noted that the more equipment was out of use, the longer it will be out of service. This subjects the equipment to premature obsolescence without use. Room colour is important for creating a conducive working environment. Dark colours in the darkroom are not conducive for the staff (Ball and Price, 1995).

Weaknesses in other technical details like the location of the imaging department, exposure direction, access by ambulance services etc have been highlighted. Other quality issues like lack of reception areas, lack of privacy for patients of different sexes and lack of toilet facilities have also been highlighted. There is therefore a need to review the infrastructure of the imaging services in Regional Referral Hospitals entirely to enhance their quality. The available equipment is not adequate for the current disease burden and is not in tandem with the current medical practice. This is reflected in the frequent referral of patients to higher levels and yet these could have been handled at the regional level. Persistent lack of equipment eventually affects the motivation of health workers, especially the specialists, who have to refer patients for conditions they are capable of managing. Eventually this affects their willingness to stay in the regional areas and denies the population a crucial service. Efforts must, therefore, be made to equip the units appropriately to keep the patients out of national referral levels for simple reasons, and to maintain and advance the knowledge and skills of the professionals.

The study also found that imaging equipment has fallen into disrepair in five units, yet the repairs could have been done locally in the hospitals or in the regional Medical Equipment Workshops. However, this was not done due to lack of staff, funds reflecting the low priority attached to diagnostic services in general and imaging services in particular. Moreover, the available equipment is not standardized, and this may make repair at regional levels quite difficult. An earlier study in Turkey (Ozsunar et al., 2006) also showed that lack of standardization of imaging facilities was a major problem and led to poor quality of imaging services. It also increased the costs of supplies since bulk purchases could not be made. It is important, therefore, for the Ugandan Ministry of Health to enforce the standardization of imaging equipment in the different levels of care in order to benefit from the economies of scale associated with standardization.

Overall, the staffing was only about 37.3% of the approved posts. Whereas there are many reasons for this inadequate staffing, the main ones cannot be

different from those that affect other health workers e.g. poor pay, poor working conditions and work overload. In this study, only accommodation was emphasized as a problem, but there was evidence that many patients were referred to private facilities for imaging services. Most of these private services belong to the same workers who would be available in the public services. There is, therefore, need to address the question of the working conditions of the health workers, and of the imaging staff in particular. Resorting to user-fees for imaging services is not a permanent solution and has negative equity implications for the majority poor patients who need diagnostic imaging. In addition, there was noted a lack of certain cadres of staff due to lack of training capacity in the country. It is high time that courses leading to these qualifications are started in the country by the relevant authorities, to meet the demand in the hospitals.

However, the staff needs to be regularly updated through training, exposure and support supervision. The study showed that staff training activities are ongoing, although supervision from the central level is very weak. In addition, staff at the regional levels does not regularly supervise imaging services in the peripheral levels. It is essential for these connections to be made so that the delivery of the imaging service functions as a continuum. Sprawls (2007), notes that for imaging staff, continuing education and lifelong learning are critical to the application of physical principles to clinical imaging because of rapid developments in imaging methods and technology. Apart from training sessions, the staff needs to be availed with current scientific documents in their field, including internet access. Currently, the health professional councils in Uganda require evidence of having participated in training in the course of the year before they accept to renew the registration of a member. The staff should, therefore, also take the initiative of documenting their training activities in order to meet this obligation.

In this study, 59% of the patients interviewed were dissatisfied with the imaging services while 41% were satisfied. The main cause of dissatisfaction was the non-availability of the imaging services due to lack of consumable inputs. However, it is essential for the managers to know that denial of diagnostic services means denial of quality care. Therefore, in the process of prioritization of resource allocation, diagnostic services need to have a central place. Ultimately, accurate diagnosis leads to accurate treatment and reduces the costs of care for both the health system and the patient. It is therefore essential to include the requirements of the imaging services on the priority list of the hospitals.

The study also noted that the safety of patients and staff from ionizing radiation was rigorously addressed in the regional hospitals. There is need to enforce the regular monitoring of premises, personnel, equipment and the surroundings. Currently, there is no structure, at any level in Uganda, which is responsible for the monitoring of the radiation levels in hospitals. Laboratories are available to determine the radiation levels but they operate on a passive basis, only handling those requests that have been presented. Given the old age of most x-ray equipment in the country, and the lack of capacity in the peripheral health facilities, there is need for a centralized active surveillance system to ensure the safety of the patients and staff. Such a mechanism would enforce the adherence to the approved radiation standards, the use of the necessary PPEs and monitoring equipment by the staff and, especially, the respect for mandatory body checks for radiation. Given the important causative association of ionizing radiation and malignant conditions, this is an urgent requirement which even calls for accreditation of hospitals on the basis of their ability to adhere to the standards.

Finally, the study also reveals a breakdown in the referral system in Uganda's health system. Whereas patients have the right of choice of health provider, if they have been actually referred, there should be records to attest to this. Instead, the study finds glaring gaps in record keeping about referrals at both the sending and receiving ends. It is therefore difficult to trace the treatment history of individual patients. Moreover, medical records in Uganda are not computerized and the country does not have unique patient identification numbers to enable the linkage of data. Therefore, is difficult to maintain a continuum of health care at different levels of the health system. This is an area that needs to be addressed at a higher level within the health system.

Conclusion

The provision of diagnostic imaging services of good quality is essential to the provision of an entire package of good quality care. Good investigation aids correct diagnosis, which in turn aids correct treatment. In turn, correct treatment saves health and life, and saves resources for the patient and the health system. This study found that the quality of diagnostic imaging services in Uganda is quite poor. It is characterized by frequent stock-outs of consumable inputs, lack of staff, poor adherence to safety standards, insufficient infrastructure and lack of supervision. Even though the country operates universal free access to health services, user-fees are charged for imaging services in some hospitals, thus creating a barrier to the poor.

Referral of patients for further imaging services is not recorded and it is hard to analyse the needs of the imaging services on the basis of referrals. This study exposes the weakness in the imaging services in the hope that they may be addressed for the benefit of the population which uses the services of regional referral hospitals.

Recommendations

To address the highlighted challenges, there is need for recruitment of additional staff to fill the identified gaps, with special emphasis on the missing cadres, especially nurses, sonologists and medical physicists. However, there is need to re-assess the workload in the various individual hospitals because the proposed numbers may even be too few for some hospitals. There is need to standardize the equipment in the hospitals to enable bulk purchasing and to ease their maintenance. There is need for new buildings for the imaging services, which would be properly located on the compounds and properly constructed and equipped to ensure the safety of staff and patients. There is need for an active surveillance system for potential radiation leaks in the hospitals and an accreditation system on the basis of the level of imaging safety.

Support supervision for the imaging services from the central level to the regional level and from there to the peripheral levels needs to be strengthened and made regular. The funding of consumable inputs for imaging services needs to be made a priority for the hospitals, because accurate diagnosis affects the spending of resources on medicines which are their current priority. Although this study addressed key aspects of quality of care, there is need for further research to determine the actual workload of the staff. This would enable the determination of workload-based staffing levels. The current recommendation is that all regional hospitals should have 14 staff but this may have no relationship to the actual workload on the ground in all the hospitals. Finally, this study focused on public regional hospitals. However, a great majority of patients receive their imaging services from general hospitals at the district level and from private hospitals owned by faith-based organizations and private individuals. In order to have a comprehensive picture, there is need to survey all these providers to enable good planning.

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