Utilization of ICTs for Accessing Health Information by Medical Professionals in Kenya: A Case Study of Kenyatta National Hospital

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Abstract.

Background: The study was conceived with the aim of investigating the availability and utilization of information and communication technology for accessing health information by medical professionals in Kenya. The study started from the premise that access to relevant information and knowledge is critical to the delivery of effective healthcare services.

Objectives: These were to: identify the information needs of the medical professionals; determine the sources and channels of information used by the medical professionals; identify the factors for which they require ICT support in accessing health information; establish the extent of the current usage and level of adoption of ICTs among the medical professionals; determine the potential challenges and prospects of utilization of ICTs in health information access; and suggest and recommend measures to be taken into account in the improvement, adoption and use of ICTs in health information access by the medical professionals.

Design: Semi-structured qualitative interview study. Data were collected on individual occurrences of the phenomenon. Grounded theory approach was used as an analytical tool.

Setting: The research was exploratory in nature and used Kenyatta National Hospital as a case study

Results: Major themes that emerged from the data are highlighted. The key findings of the study were that: medical professionals needed information continuously in the course of their clinical work. Clinical governance, care of patients and professional updating on the current medical practices were the main reasons for needing and seeking information. When the medical professionals needed clinical information, they turned to colleagues. Text books and journals were also frequently used sources of information. However, there was a substantial preference for e-searching for information from the internet and e-journals. The findings revealed lack of library and information services, inadequate access and use of electronic information resources and inadequate ICT skills among the medical professionals.

Conclusions: Many critical information needs of the medical professionals were not being met adequately. Improved usage of ICT was viewed as the only realistic strategy for enhancing information access and information sharing among the medical professionals at the hospital. Recommendations for enhancing access to health information at KNH include: establishment of a hospital library and information services; appointment of information professionals with skills and capabilities to conduct online information searches to assist in clinical decision-making and ability to train clinicians in ICT skills; formulation of ICT strategies and policy; capital investments in the form of internet and supporting ICT infrastructure; involvement of all stakeholders; and allocation of adequate financial resources for improved access to health information by the medical professionals. A framework for establishing an e-health library was proposed and presented.

1. Background

This paper is part of a larger study that investigated the use of ICTs for accessing health information by medical professionals in a hospital setting in Kenya. The study started from the premise that access to relevant information and knowledge is critical to the delivery of effective healthcare services.

Although it was an academic study, the investigation of health information access and characterization of information needs of medical professionals is an applied piece of research because the purpose was to illuminate and understand the nature of human and societal concerns or problems. This paper presents some preliminary findings from a qualitative study undertaken by the author to investigate the availability and utilization of information and communication technology for accessing health information by medical professionals at Kenyatta National Hospital, Kenya.

There is little if any evidence that the majority of healthcare professionals in Kenya have better access to adequate and reliable information. Kenya continues to face health threats characterised by ravaging HIV/AIDS pandemics, spread of infectious diseases and malaria, high levels of infant mortality and maternal mortality, low levels of life expectancy and deteriorating healthcare facilities (Government of Kenya, National Development Plan, 2002). The potential of ICTs have not been fully harnessed systematically to bring about improvements and quality healthcare services. There are problems in the health care delivery services as a result of lack access to adequate and reliable information.

Some known and assumed barriers include: lack of physical access (slow or unreliable internet connectivity, high subscription cost of information materials; lack of awareness of what is available; lack of relevance of available information (i.e. not meeting peoples' needs in terms of scope, style, or format); lack of time and incentives to access information; and lack of interpretation skills. these problems have also been attributed to our 'information systems and services, which are not understood, unmanaged and under resourced'.[15]

The overall aim of the study was to investigate the availability and utilization of ICTs for accessing health information by medical professionals in Kenya and recommend measures to be taken into account. The study was exploratory in nature and used Kenyatta National Hospital as a case study. The specific objectives were to:

1. Characterize the information needs and information seeking of the medical professionals;
2. Assess the barriers to information access;
3. Establish the current levels of adoption and use of ICTs among the medical professionals;
4. Determine the potential challenges and prospects of utilizing ICTs in accessing health information; and
5. Suggest and recommend measures to be taken into account to improve access to adequate and relevant information for the medical professionals.

The study was guided by the following research questions: What kinds of information do medical professionals need for their daily clinical practice? How do medical professionals at Kenyatta National Hospital obtain information to guide their clinical practice? To what extent do the existing health information systems/services meet their information needs? What kinds of ICTs are available to the medical

professionals at Kenyatta National Hospital; and to what extent are they utilized in accessing information for clinical purposes? What are the impediments to ICTs utilization by medical professionals? How can the use of ICTs be enhanced for improved access to relevant information and knowledge for medical professionals?

2. Literature Review and Related Studies

The literature review has revealed little empirical research into information needs and barriers to the use of information among medical professionals in developing countries in Africa; and Kenya in particular. [19,20,2,5] studied the provision and dissemination of various facets of health information to diverse residents of rural communities in Kenya. [22] carried out a study on information needs and information seeking behaviours of medical research scientists at the Kenya Medical Research Institute (KEMRI), Kenya. The findings of the study indicated that the information needs of medical scientists were not being fully satisfied by the information systems and services that were accessible to them. The study cites inadequate funding as one of the obstacles to effective delivery of information services to research scientists.

In Malawi, a study of 57 healthcare professionals indicated that they mostly used clinical handover meetings, seminars, and workshops as sources of information; and particularly for their continuing professional development.[1] The study also found that only 5.3% had access to the internet facilities; as such there was a need to explore other ICT tools as vehicles for transmission and delivery of healthcare information in Malawi.

A systematic review published in 2003 reviewed 19 studies describing the information seeking behaviours among physicians. All were carried out in developed countries and most of which took a quantitative rather than qualitative approach. The review concluded that the physicians used a wide variety of information sources. The most frequently used sources were printed text (especially the prescribing guides: Physicians' Desk Reference); the second frequently used was colleagues. What led to these sources was first their availability and applicability, then their reliability, high quality and speed of use.[9]

The digital divide has been identified as a special problem in healthcare that can lead to significant disparities. There is evidence that access to ICTs themselves remain a problem.[8] [26] carried out a survey of 46 countries in sub-Saharan Africa to discover the impediments to providing access to global knowledge in sub-Saharan Africa. Respondents suggested that unreliable electricity supply and high cost of ICTs was significant barrier to accessing online information. [4] carried out a study of utilization of IT among healthcare professionals and students in Ile-Ife, Nigeria. The study found that only 27% of the doctors demonstrated good knowledge and 54% showed good utilization habits. The author attributed the poor utilization patterns to lack of structured training and accessibility; and suggested introduction of ICT literacy programmes and adequate computer laboratories.

To gain an understanding of the status of the development in the adoption and use of electronic tools and resources, International Network for the availability of Scientific Publication (INASP) undertook a survey on the current status of library digitization of publicly funded university libraries in the sub-Saharan Anglophone Africa (www.inasp.info/pubs). The survey found that internet connectivity was uneven with only 35% of libraries having more than three quarters of their computers connected to the internet. Luck of funds for the purchase and maintenance of hardware and e-

resources together with lack of/or retention of library staff were identified as the main challenges, followed by the low levels of ICT literacy and e-resources use among the users.

The survey concluded by calling for increased support for the instigation and completion of the library automation projects as the building block of a digital library, sufficient ICT facilities and adequate connectivity [18].

From the foregoing, many developing countries including Kenya experience a combination of multiple and complex constraining factor including: high vulnerability and dependence on political rather than organizational power [7]; a high degree of external donor dependency[29]; constraints of human capacity[25]; and high cultural diversity[3]. These conditions and many others contribute to highly fragmented information systems and services which were described earlier by [15] as '*not well understood, unmanaged and under-resourced*'. This perspective helps to see these relationships as being complex and being shaped by multiple processes, including those related to history, culture, infrastructure and people.

Health information systems and services can best be conceptualized as a heterogeneous network comprising of people (medical professionals, information professionals, health managers, planners, donor communities etc.) artefacts (computers equipments, hardware, computer applications, electronic information resources, databases, data collection and reporting etc.) and social political structures. Conceptualized in this way, access to health information by medical professionals is emphasized as something more than just a technical issue; it includes the interests of various stakeholders, artefacts like computers equipments and applications relating to health information systems, the practices of people and organizational routines. The emphases on the multiplicity of stakeholders help to place focus on their different rationalities and the challenges of aligning them.

3. Research Design and Methods

The purpose of the study was to investigate the issues underlying the use of ICTs for accessing health information by medical professionals in Kenya. This is an aspect of user behaviour and acknowledging the social character of the research and the phenomenon under investigation, a qualitative research paradigm was adopted in order to acquire an in-depth understanding of the interpretation and definitions of the situation presented by the medical professionals, rather than to produce a 'measurement' of their behaviour. According to [24], " … inquiry must be carried out in a natural setting because the phenomena of study, whatever they may be – physical, biological, social, psychological – take their meaning as much from their contexts as they do from themselves (p. 189). [12] also emphasizes that qualitative research seeks to understand the phenomenon as respondents see it.

3.1. Case Study Strategy

Given the interpretive stance adopted in the study and the nature of research questions, the complexities of ICT utilization and health information access in resource-poor settings such as Kenya could not be examined holistically by placing clear and predefined boundaries. The process involves multiple actors often with heterogeneous

interests at various levels of health institutions. Case study approach was therefore the most appropriate research strategy for this research. According to [30], case studies provide the main vehicles for research in the interpretive tradition. The case study strategy has been argued to be particularly useful for practice-based problems where the experience of the actors is important and the context of action is critical. [23,13] This approach enabled the researcher to identify various interactive processes at work in the context of medical professionals' information seeking and access which would probably not have been revealed in a survey.

Grounded theory was used as analytical tool in this study, which was conducted within a holistic-inductive paradigm. Data were collected on individual occurrences of the phenomenon. Patterns, themes and categories emerging from data were identified inductively rather than deductively.

3.2. Research Setting

The study was conducted in Nairobi Province at the clinical services departments of Kenyatta National Hospital. The primary factors that were considered in choosing KNH were: First, KNH is a National Referral Hospital, and the second largest hospital in Africa with a bed capacity of 1800. It offers highly specialized services and has a high concentration of medical professionals specialized in different medical fields. It is the major training institution for healthcare personnel in various disciplines and a reference point for training post-graduate medical doctors in various specialties and also for providing internship for health professionals. The presence of this mix of features made KNH appropriate for this study, hence the choice of the site.

Secondly, the hospital is currently undergoing reorganization and restructuring in response to the health needs in Kenya and within the region as outlined in the recently launched 2005 - 2010 Strategic Plan, this provided the opportunity to collect empirical data for the study.

3.3. Sample Size and Sampling Procedure

Purposive or theoretical sampling is used in qualitative research to focus on perspectives of those who are known to experience the phenomenon of interest. An in-depth exploration of an individual's experience is the goal rather than being concerned with the ability to generalize their experiences to a larger population.[24]

The study followed theoretical sampling strategy as originally defined by [14]. This sampling strategy directs all data collection efforts towards gathering information that will best support development of the emerging theory.[14] The objective was to sample for maximum variation[27], selecting a relatively small sample of great diversity to produce detailed information-rich descriptions of each case. Any shared themes that emerged being all the more important for having come from a small heterogeneous sample. This sample was not chosen on the basis of some 'a priori' criteria, but inductively in line with developing conceptual requirements of the study. The interviewees were chosen for their relevance to the conceptual questions and on the basis of their willingness to participate in the study rather than their representativeness. Thirty-nine medical professionals were interviewed. Those interviewed represented the major professional groups at Kenyatta National Hospital: anesthesia, dentistry, dermatology, radiology, general practice, internal medicine, obstetrics/gynecology, pediatrics, pharmacy, and surgery.

The size of the sample could not be predetermined. The total number of respondents to interview was reached heuristically. Although it was possible to acquire more respondents for the research, the decision to stop adding respondents was taken when nothing new was being learnt from the interviews – a state of theoretical saturation had been achieved and the gathered data was believed to be sufficient for a thorough analysis. Patton has pointed out:

"….there are no rules for sample size in qualitative inquiry. Sample size depends on what you want to know, the purpose of the inquiry, what is at stake, what will be useful and what can be done with available time and resources... The validity, meaningfulness and insights generated from qualitative inquiry have more to do with information-richness of the cases selected and the analytical capabilities of the researcher than with the sample size".[27]

3.4. Methods of Data Collection

The primary data collection method was semi-structured interview schedule with open questions. The participants answered the same questions which enhanced the comparability of responses while the open nature of the questions allowed further probing into the responses, which greatly enriched the data collection. As a first step in the data collection phase, pilot interviews were undertaken to check the validity of the schedule and interview questions, to determine the length of time it would take to perform the entire interview, and also to ensure that the interviewer was comfortable with the interview process.

Potential interviewees were initially identified from those individuals who showed willingness to be interviewed. Further interviewees were selected using snowball sampling since several respondents recommended other medical professionals working within Kenyatta National Hospital that they knew to have opinions relevant to the research. As recognized by[10], employing snowball sampling proved to be an extremely effective technique of locating information-rich cases relatively quickly; a priority considering the time limitations of the study. Moreover, the fact that the said participants were recommended for the study by someone they knew made arranging interviews easier than if each person had been approached 'cold'.

On average, each interview typically lasted for thirty minutes. The respondents were provided with an initial overview of the questions, but were not required to follow strict guidelines. A combination of the interview guide approach and the open-ended approach[27] was used as a way of making the most of the time available while also collecting systematic data, which is easier to analyze. Furthermore, and in order to obtain the respondents' attitudes, beliefs and feelings with regard to access to health information, they also needed to be allowed to express themselves freely and in their own words. Secondary data collection methods included observation, field notes and documentary sources. These allowed for triangulation.

3.5. Ethical Considerations

Ethical approval was sought and granted by the ethics and research committee. During the design of the research, a number of issues were identified including the need to inform participants of the purpose of the research, to obtain informed consent, the requirement of confidentiality and the right of the participants to decline to participate.

3.6. Methods of Data Analysis

Categories were generated inductively after cross-case analysis and open coding was done for each question in the interview. This involved an analysis of each question, noting key remarks, concepts or categories, cross-referenced to interview occurrences (interviewee number(s), interview question(s) and field notes, which as described by[11] 'represented a kind of item-on term approach'. Cross-case coding of each question in the interview schedule meant that all the data in each question and from each interview was covered exhaustively.

Coding was done in three stages as expounded by[28]. Hence axial coding followed open coding and finally selective coding. Substantive statements in response to questions asked in interviews with respondents were coded. There were no specific rules to define which segments of the text would be coded; these segments were chosen based on the existence of clues for the presence of coding categories. There was no restriction concerning the number of codes assigned to a segment of text. The codes were collected into themes which had emerged from the interviews, and these themes constitute the different sections in the results.

Interpretation of the data must include the perspectives and voices of the people, because interpretations are sought for an understanding of the actions or patterns of actions of the individuals being studied. Therefore, responses from the interviewees' statements were used throughout the process to facilitate validation of the findings and these are quoted in italics.

4. Results

Major themes emerged from the data, these are highlighted below:

4.1. Information needs and information seeking

When the participants were asked to describe some situations they had encountered, where they needed information/or help to be able to continue with their clinical work, they were all very emphatic. The respondents interviewed indicated that they all encountered difficult disease conditions on several occasions, and at times face dilemmas of treatments and diagnosis when they needed and sought help in one time or another. Some respondents could remember specific situations. One respondent, a cardiothoracic surgeon talked of "*a specialized surgical case of a lady he had undertaken*". (Int002)

In another instance, the respondent from the department of obstetrics and gynaecology recalled a case he had encountered that required*: "the management of HIV/Aids in pregnancy and gynaecological cancer"*. (Int012)

In another interview the respondent narrated his encounter with some *"cases of massive tumour of the face."* (Int001)

In all these instances, the respondents reported that they used various means to pursue their information needs and to address clinical dilemmas. However, for most of the respondents it was not possible to remember a single situation right away, but acknowledged the dilemmas they faced in the course of their clinical practice, as illustrated by the following two quotes:

> *We normally come across many cases in the course of our clinical work that we need to refer in one way or another".* (Int007)
>
> *Sometimes cases arise of multidisciplinary nature and you are faced with dilemmas of how to manage them* (Int019)

This question was used at the beginning of the interview to create a relaxed interview environment and focus participants' thought processes on the subject of information needs and information access.

4.2. Types of information needed

The participants needed information for their practices, even if they don't acknowledge this; they don't really seek information, they talked more of *'being constantly informed'*. Seven distinct categories of information were discerned from the participants' statements about the kinds of information they required for their clinical work:

- Patient care information
- Pharmacological (Drug) information
- Recent advances in medicine
- Latest approaches to treatment modalities
- Medical-legal information
- Latest information on current practices in medicine
- Clinical trials and case reports

Needs for information arise continuously during the course of clinical practice, especially for the physicians in training; for example during patient examination, when participating in ward rounds or attending conferences. In order to give their patients a better and more accurate diagnosis, they needed not just information, but also continuous medical education and lifelong learning. Clinical information was viewed as a high priority to ensure clinical interventions were evidence based. Some participants felt that there was '*inadequate amount of information out there about diagnosis, about management, about effective forms of treatment for various ailments, or changing forms of treatment – even basic things, administering medication and monitoring side-effects.*' Others needed to get information for their field of specialization or to prepare some lifelong learning events for their role in teaching and research.

4.3. Information sources consulted

Interviews with respondents confirmed that they had established their own personal information domains – their own routes to information using a cluster of resources – *professional networks, professional societies, and e-resources, specific journals and reference materials*. For the junior doctors and registrars, study and training stimulated much of their information needs, satisfied through *printed textbooks* and *journals*, the *Internet*, *Google searches* and *medical databases* such as the Medline. Most professionals acknowledged approaching work colleagues in the office or in the team for information. They also made use of colleagues on professional courses to remain up to date. Frustrations in getting access to up to date textbooks and journal articles were noted. The potential of full text e-resources and reference materials were confirmed. They needed rapid access to reliable and relevant information when encountering new and/ or difficult conditions. Journals and the Internet were essential for general updating; specific reference sources were used for clinical support. Access to libraries was particularly difficult and electronic access would appear to offer a way for them to be able to access and use a wider range of resources. Medical professionals at KNH had no access to computers and did not use them in their places of work.

In response to the question on the mechanisms they use to address situations when faced with dilemmas of diagnosis and treatment, the respondents identified the sources of information they used most frequently:

Professional colleagues: All the participants interviewed indicated regular use of colleagues and other medical specialists as their preferred first information source choice alongside textbooks and journals.

> *With multidisciplinary cases such as this we consult among colleagues.* (Int001)

One respondent stated in reference to a surgical case:

> *"I had to consult the professor and other professional colleagues."* (Int002)

Another respondent talked of "*consultation with senior doctors and specialists' in-charge of the departments.*" (Int021)

All medical professionals interviewed communicated with colleagues probably because this method (source) could provide an immediate, accurate, and reliable answer to a patient care question, while the patient was still with the doctor in the consultation or examination room. Most of the medical professionals preferred to talk informally to the colleagues with whom they were working with in the same unit as one respondent said:

> *Because we are usually more than one here in the Casualty [department], I (we) normally consult among ourselves.* (Int007)

For formal referrals, medical professionals referred patients with formidable medical problems to medical specialists in specialized clinics within the hospital. In this respect, some respondents had this to say:

> *If you think that the case is more complicated, it is normal to refer it to a consultant in a specialized clinic.* (Int007)

> *If you feel you have not consulted enough (still uncertain), you send the patient to the concerned clinic.* (Int003)

This happens most frequently in the Casualty department, which is normally the first point of call for most of the patients coming to seek medical services at Kenyatta National Hospital. The transfer of patient care information occurs through discussion of the patient's medical problems and the receiving specialist's review of the referral report. Colleagues thus serve as an easily accessible source of information, usually saving the time and effort required to consult books and journals, even for those with personal collections.

Pharmaceutical representatives: Information from the pharmaceutical companies and their representatives was also valued and seen as readily available by some respondents, possibly due to their highly proactive and personalized approaches targeting doctors with drug information.

Textbooks and journals: Textbooks and journals also served as important sources of information for the medical professionals. All the participants used either of these two as one of their major sources of information. Handbooks are especially common in the pockets of registrars and interns as one respondent noted:

> *I use books (pocket handbooks) for clinical purposes.* (Int003)

The most frequently used handbooks commonly found in the pockets of medical practitioners were the British National Formulary (BNF) and Monthly Index of Medical Specialities (MIMS), revealing the importance of pharmacological (drug) related issues of uncertainty. Interestingly drug related enquiry was the only context in which information seeking occurred in the presence of the patient. This may be due to the reason that clinicians anticipated finding answers to their questions about medications quickly and easily, probably because of their familiarity with the format of the BNF and MIMS from the earliest stages of their medical training, and their well-established use in practice.

All respondents used journals as a source of information. It was established however, that none of the respondents interviewed had individual journal subscription, although one respondent reported sharing *"cardiothoracic journals with colleagues"*. (Int002)

The majority of the respondents reported that they accessed these resources from the libraries outside Kenyatta National Hospital, and specifically from the University of Nairobi Medical library and the Nairobi Hospital library. Kenyatta National Hospital being a teaching and referral hospital, the respondents in this study were therefore more oriented towards teaching and research; hence their preference for textbooks and medical journals as sources of information. Three respondents reported having personal collections that they used.

Internet and e-journals: Internet and e-journals also serve as important sources of information for the medical doctors. Almost all the respondents interviewed described

using the Internet and using Google for searching health information from the World Wide Web. When asked whether they had access to the Internet facilities in their institution, the answer was in the negative.

When the medical professionals were asked where they go for the internet services, the majority said that they used the cyber cafes in the town and at the Post Office, as well as the internet facilities at the University of Nairobi, Medical library, Nairobi Hospital and Aga Khan Hospital libraries, and AMREF Information and Resource Center. One respondent reported having access to the Internet services at home. Another one respondent accessed the Internet from Africa Air Rescue (AAR) where he does his locum. The key informants interviewed confirmed lack of the Internet facilities at KNH.

> *The proper facilities are not available currently [due to], ignorance or lack of interest from medical professionals.* (K01)

Personal Digital Assistant (PDA): The findings of this study revealed that Personal Digital Assistant had little use as a medical information source. Only one respondent among the study participants had access to a PDA, which he used, as a source of clinical information.

Through the use of hand-held computers, it is now possible to search for information at the bedside – '*the point of care*', enabling information to be checked before decisions are taken with a resulting benefit to patient safety.

4.4. Use of clinical guidelines and protocols

The findings of this study revealed the importance of the medical doctors' personal experience as a knowledge source for practice. Much of the clinical information used by the medical doctors comes from peers, personal notes on patients or diagnostic tests. Doctors preferred to seek opinion of experts rather than consult guidelines or manuals.

During the interviews, some of the participants indicated awareness of only a few specific guidelines from the Ministry of Health. These were mainly in form of charts and posters. They particularly mentioned the guidelines on the 'management of rape cases'; and 'management of HIV/AIDS patients', some of which were conspicuously displayed on the walls in most of the consultation rooms in the hospital.

> *There are some standard operating procedures and protocols, but where do you get them?* (Int005)

> *The few that I see on posters are issued from the Ministry of Health; otherwise most of us use the principles we acquire in our professional training.* (Int002)

Generally, the guidelines and protocols were viewed as neither useful nor accessible for resolving uncertainty arising from clinical work. Majority of the participants interviewed believed guidelines described routine practices that were already familiar; rather than providing direction when unforeseen need for information

arose.   They were also quick to acknowledge that it usually was quicker and easier to consult a professional colleague when the need arose.

Moreover, doctors indicated that often protocols were not based on up-to-date evidence, and this claim was validated by findings from secondary sources. Audit of the available sources of information also revealed that written clinical guidelines and treatment protocols at Kenyatta National Hospital were not well developed.

4.5. Reasons for seeking information

Articulated by all the respondents, the clinical care of patients was the primary reason for seeking information. The majority of doctors interviewed were able to cite recent examples of their quest for clinical research evidence. This search for information appeared to vary in methods and motivation. Some considered consulting a senior colleague, a medical consultant or informed peer for their opinion as search for evidence, whilst others engaged in printed text and journals for information. A number of medical professionals in the sample were registrars whose information seeking behaviours were motivated more by professional examinations than by the desire to search for information to inform their immediate clinical practice. Information need was therefore perceived as problem-oriented.

However, for the majority of doctors gaps in knowledge identified during the doctor-patient consultation and the need to enhance the quality of services they offered to their patients motivated them to make effort to seek information.

> *The major reasons for seeking information are to aid treatment and management of patients.* (Int007)

> *To give [provide] better patient care service and also to keep up-to-date and well informed on the current developments.* (Int026)

One respondent specializing in diagnostic radiology said that:

> [One of] *the major reason for my seeking information is to be able to interpret medical images (MRIs) for effective diagnosis and treatment of patients.* (Int004)

Information seeking occurred almost exclusively in relation to the 'structured' clinical uncertainty-surrounding medications, that is to say; to check dosage of currently introduced drugs, frequency of drug administration or their side effects and interactions. In addition, backing up prescribing decision was also cited as a factor that prompted information seeking as frequently as specific gaps in knowledge on 'new' modes of treatment and diagnosis motivated medical professionals to pursue information. As this respondent pointed out:

> *For confirmation of drugs and dosage: just to make sure that you are doing it right to guide treatment of patient.* (Int004)

Sources accessed for these purposes included the *British National Formulary* (BNF) and *Monthly Index of Medical Specialties – Africa* - popularly known as MIMS-Africa.

Kenyatta National Hospital being a referral hospital, the respondents were likely to encounter many rare disease conditions and which are likely to be multidisciplinary in nature, and this may also have prompted them to seek information as one noted:

> *Some conditions in patients at KNH require a further consultation as this is a national referral hospital; also treatments of various [disease] conditions are continually changing, hence the need for information.* (Int021)

The need to update, keep abreast of developments was expressed by more than three quarters of the respondents. Due to the dynamic nature and the need to provide quality patient care service, medical professionals need to be well informed of the current and best practices in medicine. For example, one of the respondents said:

> *My friend, medical field is very dynamic, things are changing everyday; you need to up-date yourself, and also one needs to be aware of the current advances. Continuous Medical Education is essential...* (Int001)

For the medical professionals, CME programmes and lifelong learning is an important aspect. They need to continually apply skills and knowledge, which require a process of continuous learning and improvement. After the university, lifelong learning can be local medical associations' meetings, congresses or postgraduate courses. Most of the respondents interviewed attended local and international meetings to exchange ideas with colleagues, to take educational courses to stay up-to-date on current medical practices. Although not a primary source of answers to the specific patient care questions, medical meetings serve as a valuable source of general medical information. This is important to ensure that they can deliver high quality levels of healthcare.

All the participants indicated that in medicine things change fast, hence the need to keep current by updating one's knowledge. Besides, new drugs, rare and complex disease conditions arise every now and then; and these prompt the need to seek information. In this respect one respondent had this to say:

> *In medicine things change very fast, you need to keep current by updating your knowledge, new drugs are coming up every now and then and you need to know about them for better and effective management of patients.* (Int015)

Evidently, majority of participants were more oriented towards teaching and research, Kenyatta National Hospital being a teaching and referral hospital. This therefore created the need for information to support the roles and tasks related to their teaching and research activities. Maintaining competence throughout a career during

which new and challenging professional responsibilities will be encountered is a fundamental ethical requirement for all medical professionals.

4.6. Availability of information services

Medical professionals at KNH have limited access to library and information services at their place of work. This study found that the hospital had no designated library to cater for the clinicians, save for a few book titles that were housed in one of the office room located within the personnel department. According to the library assistant in-charge the total collection was about 2000 titles. However, these contained very scanty and obsolete information materials for clinical purposes. The hospital did not subscribe to journals and neither does it have a collection development plan.

It is not surprising therefore, that only three respondents reported availability of information sources at KNH. Eight respondents reported availability of 'some' of the sources, while twenty-five out of thirty-nine respondents reported non-availability of formal sources at the hospital. Due to the lack of access to the required information and non-availability of information services at their place of work, the participants reported making use of other facilities to meet their information needs. These included:

- Internet (from commercial cyber cafés)
- University of Nairobi Medical Library
- Nairobi Hospital Library
- AMREF Library & Resource Centre
- Drug Information Service (at KNH)
- Personal collection
- Aga Khan Hospital Library
- Africa Air Rescue (AAR)
- KEMRI Library
- WHO Library (Nairobi)

All respondents reported lack of Internet facilities at their place of work and accessed the services from commercial cyber cafes outside the hospital. One respondent however, reported having the Internet services at home from where he accessed the electronic information resources. Only one respondent reported using a Personal Digital Assistant (PDA) to access electronic resources.

According to the participants, the information resources were not adequate to cater for the diverse information needs of medical professionals. In this respect some of the respondents said:

> *Certainly not, most of the key e-journals from the internet are restricted; one needs to subscribe to get access to them.* (Int001)

> *For the management of patients, they are adequate, but for research they are not; we depend on the Internet.* (Int003)

> *Books from the library are also inadequate and most of them are outdated.* (Int008)

However, seven out of twenty nine respondents said that the information sources available to them were adequate for their clinical needs. The telephone and attendance at conferences provided other important means of accessing information especially on emerging health issues and new medical practices.

4.7. Limitations to information access and use

The participants consistently identified several barriers to information access and use. These include: lack of access to a hospital library, availability and location of information resources, lack of up-to-date books and journal subscriptions, lack of computers and internet facilities, relevance of internet information to the local context, cost of information materials, lack of computer and internet searching skills/computer illiteracy and, lack of general awareness of available information

4.8. Lack of access to library and information services

Kenyatta National Hospital did not have a functional hospital library to cater for the clinicians. When the participants were asked what limitations/constraints affected access and use of information, one respondent said:

> *There is no resource centre for the staff; and no hospital library to cater for the medical professionals' information requirements.* (Int021)

Due to lack of a hospital library and information system, the respondents reported use of other institutional libraries and information services to meet their information needs [see table 5.1]. Obtaining information that can only be accessed from locations outside the hospital is a problem in itself due to their schedule of work. This was testified by majority of the respondents:

> *Unavailability of information materials, information sources are far located and scattered in too many sources away from KNH, some of which are too old. There are no Internet sites/or other information sources at the times of need for example at night.* (Int016)

> *Materials are not available in the first place. Some of the information materials are old, and most of these sources are located so far.* (Int011)

But also using other institutional library services was not without problems since they had to comply with the terms and conditions of services. As these respondents noted:

> *The University of Nairobi Medical Library has become very strict to KNH staff, unless you are familiar to the library staff. It is very frustrating. This is a problem as KNH does not have a library.* (Int004)

> *It is also increasingly difficult to gain access to the medical library of the university. If you are not a university employee or a medical student, you have to pay a [subscription] fee that I have not paid.* (Int015)

In general all the respondents did identify the very limited availability of information resources as a major limitation and a barrier to information access; *'information materials are simply not available'*. Lack of journals, lack of up-to-date textbooks and basic medical reference works in libraries was also repeatedly noted by most of the participants as a significant barrier to information access and use. Most comments about information resources by the respondents referred to access issues, holdings and general assistance. Three respondents were of the view that:

> *The libraries are not well stocked; there are only a few books most of which are not current.* (Int007)

> *Most books are outdated and there are no journals.* (Int001)

> *The library staff (Medical School library) is not helpful in any way; they do not give assistance.* (Int005)

The general lack of computers and Internet facilities at their places of work was raised by the participants as one of the major barriers contributing significantly to lack of access to information:

> *There are no computer networks and no internet facilities available to the physicians at Kenyatta National Hospital.* (Int020)

> *Probably [this is due to] lack of financial resources and inadequate infrastructure.* (Int015)

Majority of the respondents recognized the usefulness of the Internet as well as the problems of being unable to gain access to computers with access to online information resources. One of the respondents lamented about: *"limited resource persons, delays in data retrieval due to lack of computerization and limited internet centres."* (Int024)

The use of the Internet was not unproblematic. The cost of surfing the World Wide Web from commercial cybercafés was prohibitively expensive, at about ninety Kenya shillings per hour while printing of downloaded information is ten Kenya shillings per page, with most of the users only being able to spend only a few minutes online due to economic and financial constraints. During this short period, most of the users only made use of the Internet to send and receive e-mails.

The most articulated emotion about the use of the Internet was the information overload and frustrations with waiting for documents to download.

> *Sometimes the speed of the Internet is too slow; you take so long to open a document, with limited time you get frustrated and go.* (Int005)

> *Too much information from the internet, time is also limited for most of us. When the Internet slows down you get really annoyed.* (Int004)

> *Too much from the internet with a lot of irrelevant stuff, you end up wasting a lot of time browsing and going through these materials and sometimes you even don't get what you want. At times the internet gets too slow and you get frustrated.* (Int002)

The participants also explicitly articulated the relevance of the information from the Internet as it relates to the local context. As illustrated by the expressions from two respondents:

> *… [There is] a lot of irrelevant information from the internet, and limited information from our local context.* (Int022*)*

> *… Most of the free information is not relevant and there are little African oriented problem-solving approaches in the Internet.* (Int017)

Regarding the slow response time and inadequate Internet facilities at the medical school library, one respondent noted:

> *The speed of the Internet is slow and a lot of competition from the undergraduates for the Internet facilities at the medical library. Sometimes you spend two hours trying to download an image and you are not successful you get annoyed and leave.* (Int003)

Most of the relevant and reliable websites will require subscription to gain access; this also acts as a significant limitation to information access. This issue was consistently highlighted by majority of the participants. As exemplified by respondents in some of their statements:

> *I think it is because of subscriptions. Some journals require password. They request for pin numbers and user ID that you don't have.* (Int003)

> *.… another major problem with the journals from the internet is that most of them are restricted; you need to subscribe to gain access.* (Int007)

> *Some of the information is only available on subscription only and others in abstracts. Information protection, you need to subscribe to access, so if you need many articles from a number of journals it becomes very expensive.* (Int021)

Costs associated with acquiring information are also a burden. Even with the availability of some selected medical information resources availed with no cost on the Internet, the equipment access, document delivery and printing, and electronic subscription costs, however, remained prohibitively expensive.

> *.…cost of good materials is high; subscription is required to gain access to some useful websites...* (Int017)

From the interviews with the participants' lack of computer and Internet skills was another barrier to access and use of electronic information resources. One respondent had this to say:

> *The other problem is lack of technical know-how in the world of technologies.* (Int006)

Thirteen out of thirty-nine respondents reported that they lacked computer and Internet skills to enable them access and utilize information from the Internet effectively. Two respondents exemplified this:

> *I have not had any computer training; I just use trial and error when browsing the Internet.* (Int005)
> *Accessibility; lack of knowledge on Internet use and lack of knowledge on how to spread information: many people [clinicians] are computer illiterate.* (Int016)

However, it was noted that even the twenty-six respondents who reported to be competent in the usage of ICTs, had problems in Internet searching skills and were limited to searching of Google and yahoo.

> *Some of us also lack knowledge and skills to browse and evaluate the internet sites for relevance; we end up wasting time going through so much irrelevant information.* (Int007)

It was therefore not surprising that majority of the participants expressed the need for more training to enable them enhance their ICT skills. Frequently, medical professionals would also be hindered from accessing information because they were

not aware of what is available or how to locate specific resources most efficiently. Clearly, a gap therefore exists between the medical professionals' need for information and the current systems' ability to deliver it.

4.9. Constraints on the time available to find information

A number of participants interviewed mentioned the constraints of time as a major obstacle to using the libraries or even searching the information from the Internet. This originates from work pressures for the clinical staff at all levels, and the concern that time spent in information searching is not considered a priority in the context of certain specific tasks, as these two respondents stated:

> *Some of us are also too busy and we hardly get time.* (Int006)
> *Time to go to the library is also limited.* (Int016)

Finding information - to do a search, to analyze and collect information is excessively time-consuming activity. For most of the medical professionals, finding the information has to be done out of normal working hours because of their schedule of duties. Regarding access to the medical library, one respondent reinforced this view with regard to the Medical library at the University of Nairobi:

> *Medical library operating hours is restrictive to some of us who have very limited time. Sometimes they used to close very early.* (Int007)

The remote location of libraries for many and limited opening hours further exacerbated the issue of time pressure. Another respondent also noted:

> *Lack of time; unavailability of information sources; most of these sources are too old, and the location of the information sources are so far from the work places.* (Int014)

For the busy medical professional, travel to a remote library is unattractive – and probably this stimulates the high use of informal sources and other services such as the Google and Yahoo.

4.10. Availability of ICTs

The study also sought to assess the type of ICT infrastructure, including the availability and utility of ICT tools and services that support and provide clinical functionality, information access and exchange among the medical professionals. According to key informants interviewed, the hospital operated on a local area network infrastructure for the Hospital Information Management System (HIMS) and to support the administrative functions, financial operations and patients' registration only. Internet connectivity and e-mail facilities are also available.

All the participants interviewed acknowledged the presence of computers, mainly for word processing as well as limited Internet facilities in the hospital, but were quick

to point out that the equipments and the Internet facilities were not available to clinicians. A few of the respondents' comments exemplifies the situation:

> *The administrators use most of the computers available in the hospital. There are no computers in the wards or in the consultation rooms. If I have to get connected here* (Doctors' Plaza) *I have to pay from my own pocket.* (Int002)

> *Not available in the clinical services departments. Word processing tools are only available in administrative departments and offices." "…. there is no Internet facility for clinicians in the hospital.* (Int001)

> *We have no access to any computer as you can see. Most of the computers in this hospital are with the secretaries and administrative staff for their work.* (Int007)

The use of CD-ROMs to obtain information and full-text articles appears to be very low. Only two respondents acknowledged the availability of a 'few CD ROMs, a fax machine and some audio/video facilities' and 'a few computers without internet connections' in the Drug Information Unit. One clinician commented:

> *For us none, the only technology that is available is the telephone.* (Int003)

This scenario was confirmed from the key informants when asked the percentage of the medical professionals having sufficient computers connected to the Internet and with capabilities to access and operate electronic information resources. The main reasons highlighted by the respondents for having no computers and Internet facilities were the alleged *'poor attitudes and mentality on the roles of ICTs by the hospital administration, mismanagement of resources/wrong priorities and scarcity of financial resources.'* This was in response to a question asking them about the major constraints or limitations affecting access and use of electronic information resources in the hospital.

However, when one of the key informants was asked to give her opinion on what she thought were the barriers that hindered access and use of electronic information resources among the medical professionals some other factors emerged which included:

> *Ignorance or lack of interest from medical professionals, as well as resistance to change from staff and the national and sectoral (health) ICT policy which is not fully developed and implemented.* (IntK01)

4.11. Internet access and use

All participants reported using Internet access, but not at their places of work. When they were asked the outlets they used in accessing the internet services, a majority of the respondents said they did so from commercial internet cafés or other locations outside the hospital. However, one respondent reported accessing the Internet at home.

> *I have to get out of Kenyatta National Hospital to libraries at the university and AMREF or cyber cafes to access the World Wide Web.* (Int020)

It is important to note that the majority of the respondents were not confined to a specific outlet, but used multiple points at different occasions depending on the convenience. Respondents also raised their concerns and frustrations with the lack of availability of electronic full text articles, even when a relevant article is located – it is often not possible to access it because the journal is restricted and requires subscription.

When the participants were asked the main reason they used the Internet; communication by e-mail topped the list of the uses of the Internet, others uses included: medical searches, academic research, general heal information and leisure. The most prevalent uses of the e-mail as cited by the respondents were:

- Professional and social communication;
- Receiving journal alert and information on new publications;
- Communication with professional associations and colleagues;
- Personal and social communication;
- E- Medicine alerts and updates;
- E-journals alert services.

Alerting services are highly valued; minimizing the risk of missing critical information was important for the doctors.

4.12. Use of medical information databases

The respondents were asked about the use of Medline/Pub Med, HINARI and Africa Journals Online (AJOL) databases. The level of awareness of these online health information initiatives varied and was generally low. There were mixed responses on their usage.

Of the thirty-nine participants, eighteen respondents indicated the use of Medline/Pub Med. The majority of the respondents were not familiar with both HINARI and AJOL databases: eight respondents said they had used HINARI and only two indicated having used the Africa Journals Online database.

> *I only know of Medline, which I use most of the time. I am not aware of the others.* (Int004)

> *I have not been successful in the use of Medline. HINARI and AJOL are not familiar to me.* (Int003)

Even those who had some awareness of these health information databases did not appear to use them. Some medical professionals described difficulties and frustrations on logging in to some websites and especially those that require passwords.

> *I don't use Medline; I am not used to it. Most of the time I log on to HINARI, I have once used AJOL, but couldn't get what I wanted; you can't even access the East African Medical Journal. I no longer use it.* (Int007)

Some stated that even the passwords did not guarantee opening a website. Consequently, most of the respondents expressed preference for websites that do not require log in to access journals such as the Pub Med.

Some respondents however, were aware of free resources available on the Internet, some of which are meant for communities in developing countries. A few specifically reported accessing the following websites: the *'WHO websites', 'Free Dermatological Clinics', 'New England Journal of Medicine', 'Dermatology Online Journal', 'Oral Surgery', 'British Medical Journal'* (BMJ)*,'International Journal of Oral / Maxillofacial Surgery'* and one respondent reported accessing the *'Cochrane Library of Systematic Reviews'* occasionally'. The availability of these free information sources may explain why virtually all the participants in this study used the Internet as a source of health information.

4.13. Use of mobile phones

Respondents were asked whether they used their mobile phones to access and seek information for clinical purposes. Sixteen respondents out of the thirty-nine participants said that they used it 'occasionally' to consult their professional colleagues.

> *Yes, but not often. Occasionally I can consult a colleague over the phone. (Int014)*

> *Sometimes I call a colleague, but not always. (Int011)*

Nineteen respondents talked of using them sparingly or not at all, as one respondent noted:

> *I use it about once a week to consult seniors or reach a pharmaceutical company for information. (Int020)*

The high cost of calling from a mobile phone 'it is simply expensive' was the main reason highlighted by the respondent for not using the mobile phones for their clinical work.

> *Due to cost and information via a mobile phone may be short and hence inadequate. (Int021)*

Mobile phones can increase the efficiency of healthcare provision by reducing communication costs and thereby improving the interface between healthcare professionals and patients. They can also provide avenues to access healthcare and health information.

4.14. ICT skills and competencies

During the interviews, thirty-four respondents out of the thirty-nine participants rated themselves as having adequate ICT skills and capabilities to enable them utilize ICT tools and services effectively. Only five reported lacking sufficient ICT skills and competencies. The participants were asked whether they were able to search for relevant health information from the internet and other electronic databases independently. Twenty-five respondents reported that they could access electronic information independently, while nine indicated that they experienced problems and required assistance to be able to access information from the internet and other electronic sources. One respondent said in response to the question:

> *Not so well, I usually ask for help whenever I experience a problem from whoever is around.* (Int005)

When the respondents were asked to give their opinion as to why such assistance was needed, the majority of the respondents indicated lack sufficient knowledge on how to utilize various ICT tools and services; and lack of ICT equipments and other related facilities, as exemplified the following three statements:

> *Some of us also lack knowledge and skills on how to browse and evaluate the internet sites for relevance; we end up wasting time going through so much irrelevant information.* (Int007*)*

> *Use of the internet is not taught to the students, one has to learn on their own initiative.* (Int008)

> *…the local support system for the internet is poor; and lack of awareness and know-how. (Int022)*

Self-taught method was the most commonly used means of acquiring ICT skills. During the interviews the participants were asked how they learned to use computers and the Internet facilities. The majority reported acquiring the skills on their own *'through self initiatives'* and *'hands-on experience.'* In this regard two respondents said:

> *I have not had any computer training; I just use trial and error when I am browsing the internet.* (Int005)

> *Self- directed study and hands-on experience.* (Int019)

However, seven respondents reported acquiring their ICT skills through formal training, then enhancing them by active usage.

> *Through formal training- by attending a computer*
> *course, e-mail course, and learned how to use four*
> [computer] *packages.* (Int017)

Yet, another respondent said:

> *During my high school days, but most of these are*
> *learnt and enhanced in active usage.* (Int020)

Besides being ICT competent and computer literate, the majority of the participants were not quite familiar with medical information databases and websites. Comments from the participants who took part in the interviews and during informal discussions suggested the need for increased information literacy and ICT competence skills to a point where they feel confident that they can find and use the information they need efficiently and effectively.

> *…sensitize the medical personnel about the*
> *importance of these ICT tools and services.* (Int006)

> *"It would also be important for the management to*
> *organize the necessary training for the medical staff to*
> *enable them utilize ICTs and electronic health*
> *information resources effectively."(Int007)*

Extending and further enhancing e-resources would only be successful if accompanied by targeted programs of training and coaching. During informal discussions, staff that commented on the nature of training indicated a preference for structured programs of short training sessions. They also stressed that short, sharp opportunities could be more easily fitted in, as one respondent put forward a suggestion for:

> *…in-house continuous health education workshops*
> *on the use of internet and all the different ways of using*
> *the World Wide Web* (Int008)

Another respondent stressed the need for:

> *Training to influence attitude change for the older*
> *calibre of staff to adopt IT as a competitive tool*
> *(*Int009)

Desk-side training, group training, and e-learning and training programs- embedded at the point of use would provide the mix of training required to meet individual learning style. As well as increasing personal skills levels, information skills training should also enable medical professionals to know when they need the assistance of staff with professional library and information services skills and should encourage them to make full use of the available resources. In this regard, one respondent urged the hospital management to *"provide support for utilization of*

electronic resources in terms of qualified information professionals and technical staff." (Int011)

These views were also echoed during in-depth interview with one of the key informants who said that in addition to *"providing an enabling environment in terms of computer laboratories, internet and intranet facilities",* there was also the need for the training and *"enhancing computer literacy and creating awareness about the advantages of ICT usage" (*K01) among the medical staff.

The participants expressed interest in acquiring further a variety of ICT and information skills. Some pointed out the need for *'simplified ICT training'* and *'skills on computer know-how'…* to be able to utilize the Internet effectively.

5. Discussion

Comparison with other studies [6,7,16] showed similarities in the types of information needed by medical professionals: patient-care/clinical information, pharmacological information, latest approaches to treatment modalities, and current practices in medicine, medico-legal information, clinical trials and case reports. Clinical/patient care information was viewed as a high priority to ensure that clinical interventions were evidence based. This study showed that the information needs of the medical professionals were being catered for through a wide variety of sources: personal experiences, professional colleagues, textbooks and journals. Professional colleagues topped the list as their preferred first choice information source. Printed sources of information were however usefully accessed during consultations only in relation to drug prescriptions. Sources used for this purpose included British National Formulary (BNF), MIMS-Africa and The Oxford Textbook of Medicine. Medical professionals however, relied mostly on services from outside due to lack of practice library at Kenyatta National Hospital.

The study findings revealed some pronounced barriers to health information access and use including lack of physical access, including limited access to the Internet and electronic information resources, lack of information skills and computer competencies, lack of time and incentives to access information, and lack of general awareness of what is available. Information is essential in health care and health promotion as it improves clinical decision-making and provides both direction and rationale for guiding strategic health behaviours, treatments and diagnosis. If the medical practitioners are to be expected to keep abreast of the 'best available evidence' they are likely to require more than their own memory capacity to do so. Weeds[31] explains that there are enormous 'voltage drops' in the transmission line for medical knowledge because only a portion of it is ever loaded into the minds of professionals, and even knowledge that is loaded is not completely retained.

When compared with researchers who *'hunt'* for the answers to their queries from all the data sources with little time constraints from the pressure of patient care, information gathering habits of most of the medical professionals could be depicted as a two stage process:

> First is *'foraging'* – when time is available and noting for retrieval what might be needed at some stage *'just in case'*.

> Second is *'recalling'* the information accurately *'just in time'* during consultation when the patient can benefit.

Physicians have little time to pursue information; therefore, information must be readily accessible, concise and up-to-date.

6. Conclusion

Information has been critical part of the medical professionals' armament of tools to provide patient care. Utilizing ICTs can offer the healthcare professionals with enhanced access to: key data at all levels from international to local, electronic libraries of evidence, peer reviewed research and practice guidelines, and network of professionals in health and related disciplines. While information access is critical in delivery of quality health care services, there are many problems that are inherent in attempting to meet the information needs of medical professionals at Kenyatta National Hospital. Through a triangulated study of medical professionals, this research has addressed a number of questions related to information needs and helps us better understand current information environment at KNH.

The study underscores the importance of access to information resources in hospital settings. Evidence-based decisions require access to information resources as well as an understanding of how to use them effectively. Results of this study point to the importance of medical professionals' access to resources that can resolve information needs related patient care, prescribing drug therapy, formulating diagnoses, latest approaches to treatment modalities, current practices in medicine. Consistent with previous studies of physicians, consultations with professional colleagues was found to be the most frequently used sources of information, particularly for issues to do with diagnoses. Other sources included textbooks and journals, the Internet and pharmaceutical representatives.

6.1. Recommendations

On the basis of the study findings, the following recommendations were made as suggestions for enhancing increased access to health information and knowledge for the medical professionals at Kenyatta National Hospital.

Establishment of library and information services

To obtain the required clinical and social practice information, library and information services should be available to all healthcare professionals at KNH. There is an expanding body of evidence from existing systematic reviews that information provided by a library and information service can influence patient care outcomes in various ways and assessment of the impact at a local level is feasible. Library and information services will also provide the opportunity to enhance health providers' clinical/health information knowledge and enabling them to keep abreast of rapidly changing health information environment. The library content should demonstrate resources for all areas of services. Books and journal subscriptions should encompass the multi-professional needs of all KNH staff.

Appointment of health information professionals

To utilize the library resources and services effectively, the role of information professionals will be crucial. Health information professionals can play a key role in

the education of health care professionals in two areas – that of training in information skills, and also in promoting an evidence-based culture. The most important requirement in this regard will therefore be the appointment of a clinical librarian who would also do more to lobby for and proactively advocate tools for modern information management as well as point out to the managers and policy makers the importance of ICT as a tool for enhancing information access and in evidence-based practice

Formulation of ICT strategies and policy

In order to realize their potentials, policy framework must be formulated that will encourage and promote the use of ICTs as tools for health information access and dissemination. The policies must address the long term users' and organizational needs; they should also be flexible and constantly reviewed in keeping with technological trends.

Provision and improvement of ICT infrastructure

There is need to enhance the technological infrastructure on which diffusion and use of ICTs can take place. In the case examined, the lack of an adequate ICT infrastructure appears to be the principle reason for hindering access to online health information resources, and is clearly a more pressing problem than a lack of available information.

ICT skills development and training

Building ICT skills is an important component of any ICT intervention because new skills are required for operating the computers, browsing the internet and making use of various communication tools such as e-mail, 'chat rooms', video conferencing etc. Providers and users need continuing education and training to learn ICT and keep up with new developments in hardware, software and services. Investment in human capacity is essential in ICT initiatives.

Furthermore, ICT skills development and training for the medical professionals should be seen as more than just a stop-gap measure, but also as vital tools needed for the promotion of evidence - based culture, which is essential to improving the quality of medical care.

Allocation of adequate financial resources

Harnessing of the potentials of the internet and ICTs in general goes hand in hand with improvement of technological infrastructure, skills development and training, and sensitization for the sponsoring organization. Adequate budgetary allocation must be provided for the purchase of appropriate hardware and software and other accessories; costs of installation, support and maintenance. KNH should also develop cost models that will sustain investment in e-resources in a way that will even accessibility of information and e-journals across all medical specialties.

6.2. Implications

The findings of the study have several implications for information access among healthcare professionals as well as for further research, namely:

- The government and health sector policy-makers: the findings will provide the employers, health administrators and managers with useful information that could be used in the planning and management of ICTs for the purpose of providing quality healthcare services.
- Medical education providers: recommendations are aimed at ensuring that healthcare professionals are adequately prepared to adapt to the eminent changes in their workplace and to be able to effectively utilize ICTs.
- Medical professionals: measures are designed to extend and enhance the capacity of healthcare professionals to utilize the potentials of ICTs in the interest of their profession. Medical professionals will increasingly find themselves needing to use ICTs both in their work tasks and in their interventions with patients.

6.3. Further areas of research

Hospitals are complex, information-rich environments in which people need to collaborate to provide appropriate patient care, with patient care teams at the core of the work. The collaborative environment in a hospital setting would provide an ideal environment in which to gain a deeper understanding of the collaborative nature of information seeking practices and processes of teams. Future lines of inquiry could also address training issues, such as, what structure should ICT training take? How can ICT training be made effective among the healthcare professional?

Current changes in government policy present exceptional opportunities for information professionals to contribute to the delivery of quality health care by emphasizing the centrality of high-quality information to the achievement of the goals of the health services. Conducting relevant research forms an integral part of the contribution that information professionals can make. Imaginative approaches will be required to deduce how best health information professionals may place their expertise at the service of health care practitioners.

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