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Computerization of the Kenyan Health Care Records

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| <p>The purpose of this paper is to create awareness of the benefits of a computerized health care system as opposed to the manual system of record keeping currently in operation within the Kenyan healthcare sector. This paper highlights the current problems that hospitals face and how they can be eliminated.</p> <p>In the research of this Thesis, it was found that the Kenyan population estimates as of 2011 records 41 million inhabitants. The largest referral hospital in Kenya, the Kenyatta national hospital currently has to contend with 3,000 manual transactions daily with stationery accounting for 12 per cent of it is administrative costs.</p> <p>Lack of computer-based files means that health care professionals cannot effectively cater to the patients' well-being. The health of these inhabitants is vital and this paper will emphasize on how computerization in the health care system will revamp it. By digitizing over 40 million records and other technology transformations, the Kenyatta hospital believes that it will contribute to the knowledge transfer and citizen transformation ecosystem.</p> <p>The research questions for this paper were: What is the current situation in the Kenyan medical record system in the health sector? How can a computer-based system be incorporated in the Kenyan health sector? What are the benefits of introducing a computer-based system in the Kenyan health sector?</p> <p>As a result of the thesis, ideas of a computerized healthcare system were formulated and a general framework of the system examined. The computer-based system derived from this paper would be able to effectively and efficiently output the identity of individuals, their diagnosis and medical history without necessarily having to go back to the manual bundle of records.</p> | |
| Keywords | medical record, computerize, health care, manual record |

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1 INTRODUCTION

As time goes by, medical care is getting more multifaceted and as new technologies are discovered, there is a need for the medical team to come up with better structures of maintaining the patients' information. Proper and accurate documentation comes in hand in hand with better medical care and implementation policies. The electronic medical record (EMR) is one of the medical tools that seek to improve medical care by providing hospitals with the kind of platform that allows for new services and new functionality [1, 1-2]. The patient information can then be updated as the patient undergoes new treatment and newer health information is discovered.

The first attempt at electronic records was the computerized patient record, or computer-based record. A patient's electronic record included all his medical history, be it clinical or administrative that was undertaken. After every medical visit, the responsible health care provider, be it a doctor, a nurse or even laboratory personnel would record the important health information and ensure it was available for future medical care of the patient. [2, 1]

According to NIH NCRR [3, 1], the Electronic Health Record (EHR) is a compiled report of all of a patient's health information that includes the patient's demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports. The EHR computerizes this information in an organized manner in which the patient has acquired health care. This is a very important tool in the provision of evidence-based care of a patient and it incorporates different health care departments to ensure an effective and comprehensive health record.

Computerized medical records are the digitalized equivalents to paper-based patient files mostly used in many small health care centers in the developed countries. In most third-world countries, however, even the large hospitals still use paper-based filing system. In Kenya, for instance, this is the current system used in major government hospitals, which cater to majority of the over 35 million residents of the country.

Computerization of the paper-based files available in small health centers in developed countries would be in practice easy as there is already a working computer-based system as compared to computerization of health care records in Kenya. One of the most commonly used methods of computerizing paper-based records is to simply scan and enter the paper-based health records into the computerized system. [4, 1]

As stated above, the computerized medical record refers to a compilation of all medical information regarding a particular patient stored in an individual file or folder in the computer system. However, the main objective of using computerized medical records is to have a specific resource that provides and avails complete and accurate information about a patient to all the health care organizations that the specific patient visits.

This means that if the patient has visited a specific health centre A, for instance, in the emergency department and is referred to a bigger hospital B, for X-ray services, the X-ray department in hospital B must be able to assess the important information of the patient as recorded in hospital A. This ensures that the patient receives optimal health care and avoids many of the common accidents such as overdosing the patient.

The patients' information also requires to be secure and available in the computerized file for future references. All the medical personnel must be able to assess and understand the information in the patient's file to ensure that the patient undergoes proper treatment and to lessen the workload of having to ask the patient for his basic health information each time he visits the hospital. [4, 2]

A computerized medical record brings with it many advantages. It presents data in a very organized manner so that each hospital department finds the required information without difficulties. This changes the way health care is practiced in that it is very unlikely to overlook important findings.

The computer-based file is then updated as new patient data is availed. This can avoid miscommunication among hospitals and health care personnel. The information can be used in future to assess the history of illnesses and how effective the medication and treatment undertaken is. Computer graphics and algorithms are usually used in computer-based health records to highlight specific health trends of a patient, such as the blood pressure, weight and height. These come in very handy in future references. [5, 1]

2 AIM AND RESEARCH QUESTIONS

The aim of this study is to acquire sufficient information on the Kenyan medical record system currently in operation. The paper also looks into the Electronic medical record systems currently in operation around the world and their advantages. It further analyzes how the Kenyan healthcare sector could benefit from integrating the electronic system of medical record storage and the diversity created by its implementation.

This paper seeks to create awareness of the benefits of a computerized health care system as opposed to the manual paper-based system of record keeping currently in operation within the Kenyan healthcare sector.

To achieve the aim and purpose of this study, it is necessary to answer the following research questions:

1. What are the benefits of introducing a computer-based system in the Kenyan health sector?
2. What are the barriers of computerization of healthcare records to be expected in Kenya?

3 BACKGROUND

Before getting into deeper details, it is important to define what a medical record is. A medical record is a collection of information that relates to a patient's health care [11, 4-5]. It is created and maintained in accordance with the hospital's rules in that the available information is correct, efficient and follows the hospital's standards. This avoids misdiagnosis which could lead to health complications and other avoidable risks.

The medical record is updated as often as the patient visits the hospital and the information helps in the guidance of the care plan given to that patient. A good example would be a patient that has had a surgical operation before. If there are any important observations such as allergic reactions or difficulties during the operation, a health record would include such information guiding future surgeons on the best course of treatment.

3.1 History of medical record keeping and its evolution

Forman's and Napier's casebooks would be the most far reaching example of proper medical records available in the 1700s. Astrology was by definition written art. Astrologers needed to compute the locations of the celestial bodies and to map them on a chart before they could make a judgement. Astrologers kept records of their consultations from at least the fifteenth century. A few examples predate Forman's, and they contain medical content. Other astrologers in seventeenth century England may have had as many clients as Forman and Napier or even more. Some of them, such as Nicholas Culpeper (1616-1664), the famous astrologer physician, specialized in medical questions, but his records are lost. [12, 1]

Astrology and medicine were cognate disciplines. Unlike astrologers, other medical practitioners used other methods to assess diseases. The signs and symptoms of a disease were assessed from the patient's complexion, pulse or urine. Astrologers therefore seem to have begun keeping written records way before medical practitioners did. [12, 1]

The most rudimentary were lists of the names of clients and their payments for treatments or prescriptions. These are account books, and need to be understood alongside the broader trends of record keeping which developed in late medieval Europe. Narratives of cures were recorded in ancient Greek medical works and the practice was revived in the fourteenth and fifteenth century. Some of these recorded advice to patients about diet and recipes; others were framed as testimonials of successful or remarkable cures, autopsies or lessons for surgeons. [12, 1]

When surviving records are labeled, in the Latin tradition they were called ‘cures’, ‘diaries’, or ‘observations’. Efforts to classify and manage these records provide another measure of how they were understood. Some of the astrological and medical records contain indexes of the names of patients, diseases or both [12, 1].

In the 1920’s individuals came to a realization that documenting the provision of healthcare was of great value to the health care providers and to the patients themselves. This unprecedented activity soon became wildly popular and used after realization that records established the details, complications, and outcomes of patient care were useful and even critical to the safety and quality of the patient experience. [13, 1]

Physicians recognized that they were better able to treat patients with complete and accurate patient history. Medical records of this day were documented on paper which explains the naming of the first professional group as ‘record librarians’ or keepers of books because all patient treatment was recorded on paper. [13, 1]

In the 1960’s- 1970’s computers were invented. Universities thought of marrying computers and medical records. They often partnered with large healthcare facilities where the patient information was created and the materialized software was only useful at that single health care facility. Hindrances including computer performance limitation and exorbitant pricing restricted the product’s usefulness out on the market. [13, 1]

In the 1980’s healthcare software development successes were deployed in different hospital departments including notable success of computerizing admission registration and computerized master patient indexes. For the first time in healthcare history, pa-

tients began experiencing and benefiting from computerized check in. The master patient index (MPI) benefit was primarily enjoyed by personnel in the medical department. The 1990's and 2000's had computerization flourishing within healthcare walls and the challenge became intercommunication between healthcare centers. [13, 1]

The method of documenting healthcare records has changed over the years from 100 percent hard-copied documents to the current hybrid of both paper and electronic records. The ultimate Health Information Management goal of fully-functioned electronic records with health information exchange in all treatment arenas including skilled, acute, home, and physician care: as well as ambulatory and emergency medicine has yet to be realized. [13, 1]

The following section focuses the framework in Management of Health care records.

4 THEORETICAL FRAMEWORK: MANAGING HOSPITAL RECORDS

Hospitals deal with the life and well-being of their patients. Good medical care entails professionally skilled doctors and nurses who not only have theoretical knowledge but also have empathy for their patients. It also entails on premium facilities and equipment.

Good record keeping outlines the most basic factor of medical care as it is a reference for the health care plan drawn. It entails accuracy and precise details, just as the patient gives them. From this record, a comprehensive updated report guides health care practitioners on the course of treatment to be undertaken [6, 1]. Failure to do this results in miscommunication and misdiagnosis of a patient's information and symptoms and this could have serious consequences including death of a patient.

Health care practitioners must always be very careful before engaging in record keeping of the patient because many small mistakes that could be detrimental could occur. A health record represents the hospital's responsibility in the life of a patient from which health reports, research and statistical reports could be drawn. Associated records such as X-rays, specimens, drug records and patient registers, must also be well cared for if

the patient is to be protected [6, 1]. Good record care also ensures that only the information necessary to the patients' health is recorded and that the storage area is freed from unnecessary and unambiguous information. This saves time, resources and the personnel can access the information quite easily.

4.1 Hospitals and Governments

Different hospitals may use slightly differently structured health record keeping models. It is therefore important to give the information precisely so that other hospitals can understand without reasonable doubt what is meant. For example, government hospitals may follow quite diversity as these hospitals are often huge and contain many independent departments. The departments could range and include X-ray, surgical wards, maternity wards, internal medicine, acute care wards, psychiatric wards and children wards.

All these wards are however linked in the record keeping systems and the information flow should be very clear to avoid misconceptions. Other smaller health centers may run just one or two of these departments. Nonetheless, the information availability of a patient should be the key factor. [6, 5-6]

Government hospital services in Kenya are available in a wide variety of models, arising partly from the geographic location and the diseases to which the inhabitants are most prone and partly from the availability of health care personnel in those areas as well as in other health care facilities available in the country. Referrals are very common in that some hospitals specialize in certain fields, for instance, only some hospitals have a surgical department.

The local government provides the health care policies through the ministry of health in Kenya. Each hospital reports directly to this ministry through the appointed board of governors. The Kenyan inhabitants are required to offer feedback directly to this ministry through questionnaires, both paper-based as well as internet-based. In addition to the

private sector are also hospitals run by charitable or commercial organizations such as churches. In all the health care centers and hospitals in Kenya, the ministry of health laws and legislations are followed.

4.2 Internal organization of hospitals

Hospitals normally have at least one or more central administrative departments, dealing with all that pertains to the business of health care and that includes policy, personnel, finance and estate matters. The hospital management caters to all the institutional services such as cleaning, catering, pottering and laundry as well as the hospital's administrative concerns.

The arrangement for out-patients varies greatly from one hospital to another. Many government hospitals in Kenya have specialist out-patient clinics, where the same patient has to visit separately for different ailments. The patient may have to visit the departments once or continuously for extensive treatment and follow up. Other hospitals simply have a general clinic, headed by a general doctor who treats various minor ailments at the health centre during the day and if need be, gives the patients referrals to specialist hospitals.

In-patients will be catered to mostly by nurses. The classification in Kenyan hospitals is usually based on gender, illness type and the intensity of the disease. Unlike in many developed countries, this arrangement at the in-patient department could vary greatly depending on the availability of finances and the patients that need acute medical care at the same time.

The figure below shows what an organizational structure looks like:

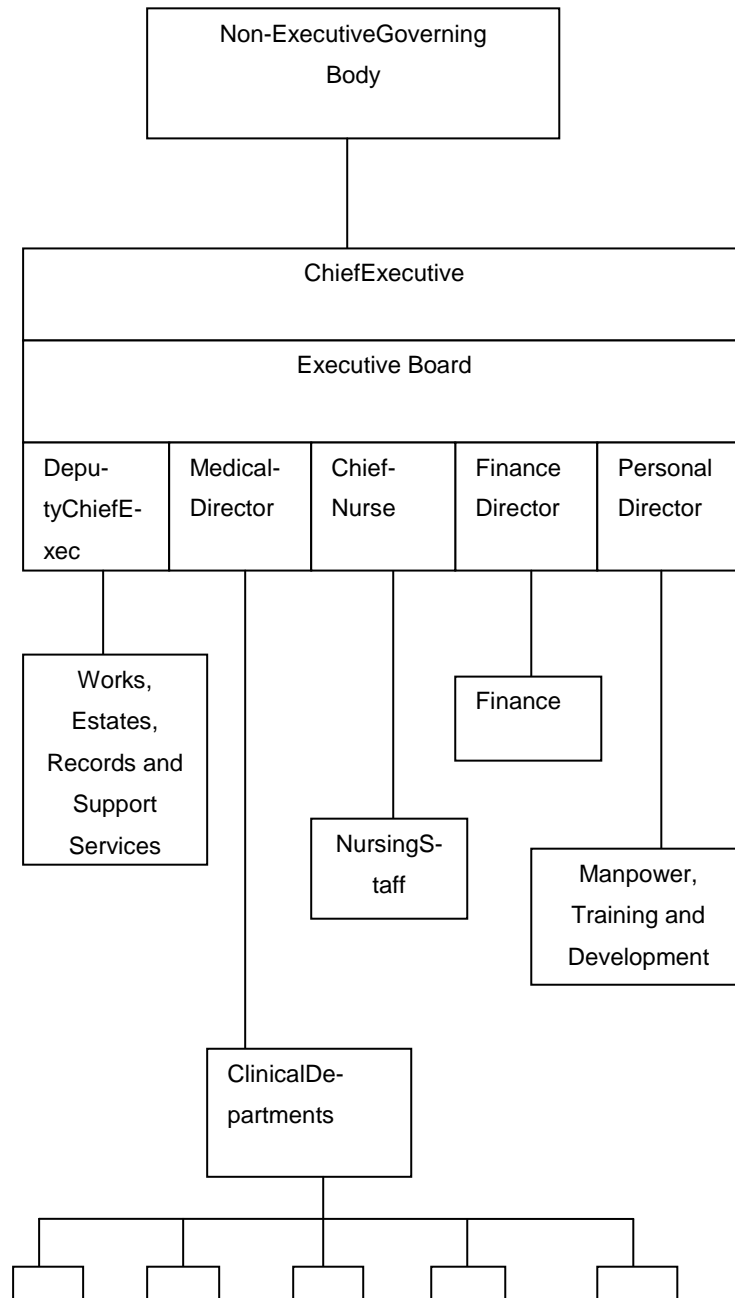


Figure 1: Typical Organizational Structure [6, 29]

4.3 Types of Records Required in Hospitals

Most patients in Kenya who come to the hospital firstly visit the out-patient department. Here, they first encounter the hospital nurses who give them a basic hospital form, locally referred to as the hospital card. In this form is written the patients' name, age, sex, marital status and the location of residence (not the full address). Note that in practice, not all of these records are necessarily similar to other hospitals. However, the same form can be used during another visit to a different hospital and is usable until it is completely full.

The patient then goes ahead to tell the nurse all the signs and symptoms of the illness and this information is recorded in a totally different file. This file remains in the hospital and will be assigned to patients on the very first visit at the hospital. In Kenya, one can visit any health care centre and hospital in the country, regardless of his location of residence.

The nurse could also write down casenotes (see the next section). After the dialogue, the nurse assesses the situation and could either administer treatment herself or advance the patient to the doctor in charge.

The doctor will then administer treatment and record it in the patients file. Prescriptions for medication will be written by hand in the patient's hospital card. When discharged from the hospital, the patient takes this card to the pharmacy to buy the medication. If the patient is referred to the in-patient ward, the medication comes from the hospital's store and is included in the patient's final bill.

Patient Casenotes

Casenotes are little pieces of information that most members of the health care system will use to write important bits of information before finally writing this in the patient's medical record [6, 10]. They could include basic information such as the signs and

symptoms, diagnostic test results and temperature blood pressure. They could also include complex information such as patient histories and allergies, as well as records of operations and other forms of treatment.

As above stated, most patients in Kenya with acute situations will undergo referral to other specialist health care centers and hospitals that are more suited to their situations. The patients are urged to avail any documentation from health care centers they visit rarely to the health care centre that they mostly visit as there is usually not much communication about patients between different hospitals. Due to lack of computerized records, the information can only be availed in paper form, that is, if the patient gets any other information apart from the prescriptions.

At the regular hospital, all the casenotes, doctor's notes, nurse's review and other hospital records available from other health care centers are kept together in one file bearing the patient's name and other personal details. With time, all these documentations form a complete medical history of the patient. [6, 10]

Accidents, emergency departments and general clinics are likely to produce fewer case-notes as the patients get immediate attention from the doctor. The hospital cards are also unnecessary at the point of arrival and will only be created after the patient is stabilized [6, 10]. In some of the Kenyan hospitals, due to lack of resources, such records are not kept at all and instead, the patient information is written on a piece of paper.

X-rays

These are large photographic film records produced for diagnostic purposes of inner body organs in response to a request from a doctor. As they are important forms of a patient's medical treatment, they are kept in the patient's file in Kenyan hospitals. Very high quality envelopes are used to ensure that the X-ray films remain intact and there is no wear and tear. However in developed countries, due to X-rays being huge, they are filed separately, according to a unique identifying number that is linked with the patient's name [6, 11].

Pathological Specimens and Preparations

Most government based hospitals in Kenya have a laboratory situated within the hospital grounds. Normal specimens taken from the patient such as plasma, serum, bodily fluids, swabs, wet tissues or whole blood samples are immediately availed to the laboratory and the patient given a time frame in which to collect the results directly from there. The laboratory personnel work extremely fast so as to avoid overloading their centre which could lead to misdiagnosis. Most laboratory results are availed within the same day.

Other more complex samples availed for further testing outside the hospital premises are handled very carefully to avoid mixing them up with other patients. Nonetheless, there is always the fear of misdiagnosis in Kenya due to the naming system of people.

In most families, the family name is preserved and that means that more than one person in the same extended family share their first and middle names. An extended family is made up of all relatives that share the same grandparents. In simple words, brothers and sisters who share the same parents and their own children all make up an extended family system.

For a case example, let the paternal grandparents names be respectively John Jack Smith and Anne Jude Smith and they have 2 children, Mary and Tom Adam Scott. In Kenyan naming systems of most cultures, when Tom marries and has his own children, if the first born is a boy, he will most likely be named John Jack Scott like Tom's father. The first girl will also be named Anne Jude Scott, in honor of Tom's mother. However, if Tom's children are both boys, the first boy will be named after his father, John Jack Scott and the second, after Tom's wife's father.

The same goes for Mary's children. The first boy and girl will be named after her husband's parents and the next boy and girl after her own parents. In the end, there will be at least two children in this specific family example with the same first and middle

names. If the grandparents have 9 children for instance, then there will at least be 9 boys sharing their first and middle names. As it is common in Kenya to have an average of 7 children per woman, there is always the possibility that at least 7 boys and 7 girls will share the same name. This is where the Kenyan paper-based hospital record keeping faces difficulties in.

Patients Indexes and Registers

It is easy to create patients registers in computer-based hospital filing systems through the use of indexing. Indexing could be very simple and in most modern countries, indexing is done by classifying patients under different addresses and locations. However, in a country like Kenya which has a large population, a paper-based index would be so hard to update and maintain. Integration of a computer-based system would come in very handy as indexing would help avoid the risk of mixing up medical records of patients who share the same name. As long as each patient gets a unique code that cannot be reused or transferred to another patient, this problem would be contained.

There could be one or more indexes to cover for the many inhabitants of Kenya which could simply contain the patients' names, age, sex and such basic information. The indexing could have each letter of the alphabet representing for instance the last name of every patient in an orderly manner. That way, drawing up a patient's file would be very simplified. All of the patients medical information could be classified into smaller folders so that if a department like medical ward wants to access the medical records from the laboratory, there would be a folder named laboratory that could provide the information in real time.

The specific index number can also be written in the patient's visit card so that it is easy to cater to patients under the age of 18, who bear no other form of identification in Kenya.

Besides indexing, various chronological registers of patients may be maintained either centrally or in individual departments. Any personnel would have to maintain some sort

of day book in which the patients of the day get registered in and this information would be updated into an electronic health record. With time, more and more patients would get registered the medical health centre or hospital, thereby ending up with an organized computer-based system. Chronological registers may be used by the hospital to record admissions, discharge, clinical visits, clinical follow-ups, laboratories, X-rays, births and deaths of patients. [6, 12]

Pharmacy and Drug Records

The prescription and supply of drugs generates a variety of records, including pharmacy stocks, ordering and dispensing records, requests for drugs from wards and departments, drug administration records and prescriptions for individual patients [6, 12]. The receipt and issue of all drugs must be recorded. The pharmacy and the ward must also keep a copy of all the records of drugs so that cross-referencing and uniform management can be documented well.

Information about dangerous or ‘controlled’ drugs especially the strong kind of pain-killers as well as medication used in the operating rooms, such as Propofol® must be recorded in particular detail in both the hospital pharmacy and in individual wards and departments, in order to avoid drug abuse among members of the staff as well as the patients. Such medication is rarely administered to patients while they are not under medical personnel supervision, like in a hospital ward.

Central Administrative Records

Minutes and papers of major committees and the governing body, serve as the central record of the hospital’s affairs. Hospitals require all the records relating to finance, personnel, buildings, accommodation, stores and other such services like hospital vans and ambulance services for reference and review of the hospital’s profits. The governing body as well as the committee requires minutes of meetings held for that hospital. In Kenya, there is at least an annual meeting in which all the hospital operations are re-

viewed and the positives and negatives considered and discussed among the health care personnel, aiming at improvement of the patient safety.

Nursing and Ward Records

The chief nurse of every single hospital work concerns provision of correspondence, reports, and minutes of meetings as well as all the necessary documentation in the executive capacity [6, 14]. The chief nurse also handles the legal files that each hospital personnel is forced to read through and sign before starting work at the specific facility. The chief nurse assesses the code of professional nursing ethics, the doctors' code of working as well as other personnel's legal laws. The chief nurse also handles the legal responsibility of patients, especially those that must be signed when very risky medical treatment is about to be offered.

The patient's personal property must also be well documented during the admission and discharge or death from the ward or department. At least two nurses are required to sign the documentation as well as the patient.

The management structure of a hospital records services is illustrated in the figure below:

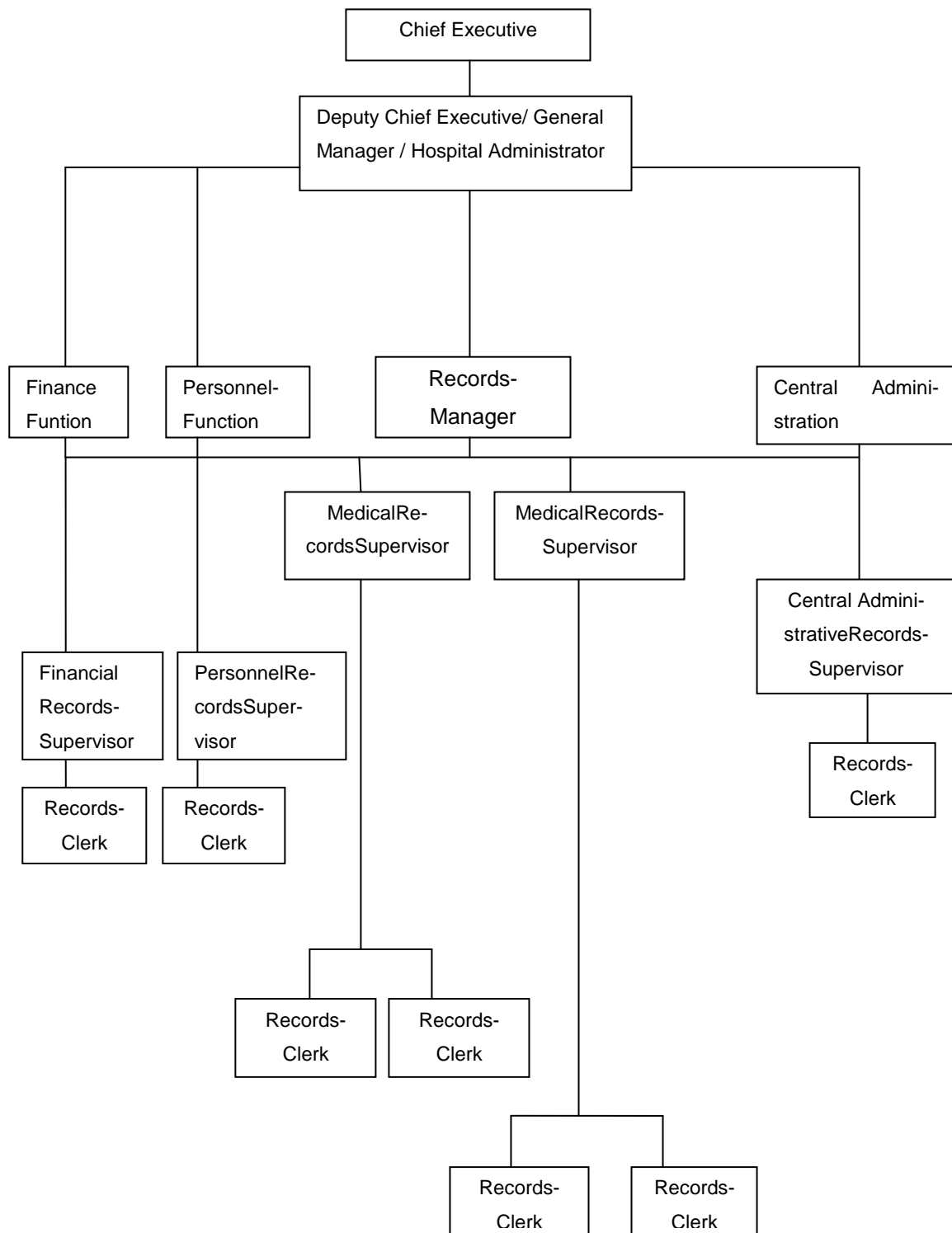


Figure 2: Management Structure of a Hospital Record Service [6, 19]

4.4 Records Management and the Management of Health Information

The information requirements and storage are a really huge and complex task that a major concern of hospitals. Management of such records and documents starts right at the effective collection of the information. The storage and analysis of these records is also of utmost importance, as it affects the creation of statistics, or by external access from a different ward, to generate information sources, whether in print or electronic form. [6, 20]

Data Collection and Diagnostic Coding

Data collection involves the hospital personnel observing what is happening to the patient as well as listening to the patient. The patient is the key source of medical records and the signs and symptoms must be carefully indicated in the health records. Observing patients is also a good practice for the hospital personnel, especially the doctors and the nurses.

In Kenya, observation is one of the most commonly used methods for determining the intensity of the illness. In some cultures, for instance, showing pain is seen as a weakness and members of such communities will suffer in silence, sometimes leading to fatality. In other communities, patients will not disclose all the signs and symptoms because it is forbidden in their culture to discuss some of the medical illnesses. In such cases, observing the patient will lead to correct data collection and analysis, thereby leading to proper treatment.

Automated data collection systems like blood pressure machines are very available but most of the hospitals worldwide use manual sheets to record this information. Some integrated data management systems allow for entering the values into already formatted graphic structures in the electronic medical records.

Medical pandemics must be recorded in special files in the electronic medical filing system, taking into account the names, ages, locations, signs and symptoms of all the patients who suffer or die as a result of these particular illnesses. This helps in conduction of morbidity and mortality analysis, quarantine, vaccines and all other required medical measures to avoid further spread of the illness.

The International Classification of Diseases, (ICD), is one of the classification schemes that study such pandemic files to strategically come up with solutions that lower the rate of infection and death complications. ICD uses 'clinical coding' or 'diagnostic coding' to assign an alphanumeric code to each specific diagnosis [6, 21]. They could also come up with treatment plans after carefully analyzing the signs and symptoms and effect of administered medication.

4.5 Retaining Casenotes at the Hospital or with the Patient

At the end of the treatment period, the patient's information will certainly have been severally saved in different departments such as the hospital's pharmacy and out-patient ward. Casenotes will also have been recorded in the patient's files and these must be retained even after treatment to avoid compromising the patient safety and evidence-based care.

Casenotes give a step by step guide on the undertaken care plan and as such, they give a backup for statistical review that may save the hospital from being sued for negligence [6, 31].

Advantages of patient-based records:

- . They save the hospital lots of recording storage
- . They cut the costs of employing more staff to record the patient data.
- . They save time when patients bring these records when revisiting the hospital as it is easier to identify and trace their hospital records.
- . They provide the possibility of using the same records if the patient attends a different hospital or clinic.

Advantages of hospital-based records:

- .The patients are not required to bring their own records when revisiting the hospital especially in emergency situations.
- . They save lots of time as the patient may have misplaced, lost, damaged or tampered with the records.
- . Patient confidentiality is enhanced.
- . There is access to records for audit or research after final discharge of the patient.
- . The records are accessible in case the hospital is sued. [6, 32]

4.6 Unitary File Systems for Hospital-Based Casenotes

Binding hospital-based casenotes must be done in different folders because keeping the information of various individuals in one folder always tends to bring confusion, especially when the patients visit different departments of the hospital [6, 33].

In the case of a country like Kenya where the filing system is paper based, there is a risk that the casenotes might get misplaced and there would be way too bulky files, making accessibility to files difficult.

In most hospitals in Kenya, the record of filing is such that, each department that a patient visits keeps a separate file for him. The problem with this is that the doctors and other healthcare personnel are not able to view a complete multiple files. This omission could lead to a misdiagnosis as many different signs and symptoms could be the cause of one disease.

For instance, when a patient in any Kenyan government hospital has to visit the ear and nose clinic, he would have to go to two different departments. The fact is that most of the ear, nose and throat illnesses are always related to a single disease and lack of accessibility to all the clinics visited could lead to misdiagnosis of the condition; unless the patient provides this information to the doctor.

4.7 Numbering Schemes

The common practice in Kenya is to assign the patient a unique code number, which is usually the same as the first hospital card he gets. The number is usable for all the visits until the time comes to renew the card (because prescriptions will be written on this patient card). Every new card brings with it a new patient code, meaning the older code is discarded automatically and the patient's records are thereby separated.

In order to revamp the Kenyan healthcare sector, this fact has to be considered. The paper-based work becomes way bulky and the hospital record library could certainly save lots of space by avoiding keeping more than one files for a single patient.

4.8 Casenote File Design and Content

In manually handled hospital records, there is a great risk in misconceptions. As everything is handled by handwriting, there is a risk that other personnel may misinterpret a medication. For instance, a doctor may prescribe orloc® for a patient and at the pharmacy; the nurse interprets it to be ormox®. In such cases, the patient safety is greatly undermined.

The patient may also be required to visit many departments meaning that his paperwork may become detached or disorganized, thus undermining the patient confidentiality code.

File Cover

Different hospitals use differently designed files for their patients. In some, the different hospital departments use different colors of files. This is the case in Kenyan hospitals. On the front of the file is printed the hospital name. On the top right corner is written the name of the patient and the sex. The patient's number is missing as this keeps changing.

In developed countries, an identification code is also written on the top cover as is the case in Finland, where they use the social security number of the patient. Other necessary information could be allergies, infections and illnesses that should be a red flag for all the personnel. This could include information such like ESBL or MRSA, so that all the personnel pay extra hand hygiene when dealing with patients suffering from these kinds of illnesses.

There have been very many cases of patients reacting to medication as their allergies were not pointed out clearly in advance, especially when the patient arrives in emergency situation. This only serves to worsen the condition of the patient.

To avoid mistakes in reading information on the top cover, the information should be written carefully in capital letters. If possible, printing of this information is vital.

A sample file cover is in the appendices section, see Appendix 1

Forms and Form Design

Lack of facilities and finances always lead many Kenyan hospitals filing systems to greatly differ. In most health care centers, pre-printed forms which guide the personnel in collecting data precisely are unavailable. Sometimes, the patient data is collected on a piece of plain paper and that could lower patient safety practices.

An example of a summary sheet is reproduced in the appendices section, (see Appendix 2&3).

Other useful forms include history sheets that monitor the patient's vital signs: temperature, pulse, blood pressure, height and weight, respiratory, blood and fluid balance charts; and drugs prescription and administration records [6, 42].

For surgical purposes, most of the wards in Kenya will try and use pre-filled forms to minimize the risk of confusion. The anesthesia and operating forms, the consent forms

which are signed or marked by patients before an operation or procedure, are some of the most important pre-filled documents. As stated above, the hospital also needs for legal protection.

Other very important departments that try and use these pre-filled forms in Kenya include: Maternity, pediatric psychiatric and funeral home departments. These help in accurate data collection thus facilitating evidence-based patient care.

Internal Arrangement of the File

The file could simply be sub-divided into departmental classes. This could provide ease of accessibility and improve patient safety. Through this, analyzing data becomes not only easy but also prevents misconceptions.

Clear labeling should be done on the dividers so that files of one year are separated from another year. This would encourage flow of information and provide statistics of the patient's health.

Closure of Files

To mark the end of a casenote file, simple indications like: 'Part 1: Closed on 31/12/2013'. The following file should be marked in relation to this. It could for instance read, 'Part 2: Opened on 1/1/2013' [6, 46].

The Master Patient Index

This file will contain clearly outlined index cards so as to enhance accuracy as well as the speed of tracing the patient's file. The most basic information of a patient, his name and age must be easily found in the index file [6, 48].

An example of an index card is given below:

| | | | | |
|--------------------------|--|-----------------------|---------|------------------------|
| Surname | | Hospital number | | |
| First name/s | | | | |
| Other name/s | | | | |
| Mother's name | | | | |
| Address | | Date of Birth | | |
| | | M/F | S/M/W/D | Asabwean/ Non Asabwean |
| National identity number | | Date first registered | | |

Figure 3: Sample Index Card [6, 49]

Other Biographical Details

Distinguishing between patients in Kenya is hardened by the fact that many people, related or unrelated could share all their names, right from the forename to the surname. How to distinguish them becomes harder should they share a birth year. This is where the personal hospital code comes in.

Every patient should have a personal hospital code that is applicable in all departments of that and all other national hospitals. This personal code should not be transferable and should be removed from the database of the hospital once a patient dies.

Identity Cards

In Kenyan hospitals, the system operates so that the patient who brings his health visit card with him is not charged consultation fees. The rest of the patients have to pay a fee at the out-patient department to get their details retrieved from the hospital library. If the patient does not remember the last day of visit at this hospital, a new file is created because the paper-based manual system contains bulky files and searching time could take weeks to retrieve the correct file.

A sample card is shown below [6, 53]

| |
|---|
| <p>KENTALI HOSPITAL PATIENT'S CARD</p> <p><i>Please bring this card with you</i> <i>On every visit</i></p> <p>Surname</p> <p>First name/s</p> <p>Hospital number: _____</p> |
|---|

Figure 4: Patient Card [6, 53]

Patient Registration

Patient registration refers to the response accorded to a patient when he comes to the hospital. That involves recording his treatment plan in an acceptable way so that there is enough proof to show all the departments visited and the course of treatment undertaken.

In Kenya, the process is such that the patient visits the out-patient and is issued with a new hospital visit card, if he does not have a previous one. Then, it is registered in the diary that the patient has attended the hospital. Then, the previous files are retrieved to check the medical history and if need be, the patient is requested to go to a different department for medical care.

In computerized systems, the process would only take a couple of minutes to enter this information in the already existing form. The nurse's work is also reduced greatly as the previous medical records are available for review. Using the computerized systems also gives the advantage of enabling appointments which can be helpful in planning of incoming patients and in reduction of so much queuing, thus making the hospital more orderly. The patients' files can be retrieved in advance to make the process of patient registration run smoothly [6, 54]. If need be, the local health care facilities can share the tasks so that no health facility has too many incoming patients. This will save the patients time and money and give the health care personnel enough time to deal with each patient.

In addition, a clearly marked appointment card can be given to remind the patient of the appointment date and time and indicate exactly which department to visit.

An appointment grid sample is attached on the appendices section (see Appendix 4)

Hospital Registration Procedures

When a patient reports to the registration point, the nurse on duty needs to check whether he already has an existing file in the hospital. In computerized systems, it is easy to check this from the index of the hospital, depending on the system used in that hospital. For instance, the patients could be saved in order of their surnames or the locations of residence. This is all easier done in computerized systems as compared to the bulky paper-based records [6, 55].

The common practice in Kenya is to open a new paper-based file for patients whose original files are not easily located meaning one patient can have more than five hospital files in the same department. This gets harder when trying to go through a patient's medical history, especially when a follow-up is required.

In the computerized system, there should be a master list that is regularly checked and updated to ensure that no patient has 2 different registrations. This will avoid the problem of detaching files which defeats the purpose of proper record keeping [6, 55].

This is especially important when dealing with patients suffering from memory illnesses like dementia. They could never reliably give their medical history or their previous hospital visits and that is why it is important to have a computerized hospital system for keeping the patient's data.

Common Registration Problems

Common problems in registration involve claims by patients that they have previously suffered the same illness and the treatment did not help at all. If the hospital records are not found, this poses a danger of repeating the same treatment, should their files not be found. The hospital personnel have to work hard to try and get the files back to guide on the course of treatment.

However, if the file is not found, then the only option is to create a new file and mark it in a way that other personnel know there may be another copy out there. A unique identification number is very useful in such situations. Hospital personnel must be advised to always record each patient's data before seeing new patients to avoid this problem.

If a reference number is known but the file cannot be found, creation of a temporary file is the only option. On this file is information that indicates there is a missing file with the same reference number and that this new file is only a temporary solution [6, 56-57].

Records of Nursing Activity

In countries which use the traditional British model like Kenya, the records are systematically marked under the day or night shift and the report updated with each shift. This includes all the activities of the patient that take place during the shift. This summarizes the patient's activity.

Again, in this kind of record keeping, personnel should ensure that they give a thorough report detailing the report so that there is sufficient information to draw up a care plan for the next shift. A verbal report is also encouraged at the time when the day and evening shifts are changing as well as all the other shift changes. This is of key importance because questions are answered promptly and every person knows what kind of duties to mainly focus on during their shift.

4.9 Storage of Hospital Records

Various modes of medical record storage are discussed further in this topic below.

Paper Records

Casenotes are stored in the patient's file as discussed before in this paper. They go to the same store that the patient's file is stored in. By using a simple numerical sequence, this can be shifted to allow for better record filing. Terminal digit filing can be used to assign records to section in which the last two digits represent the file reference. That means that in a 10-digit system, *****00, all files ending in 00 will represent one section. The next section will contain files ending in *****01 and so on [6, 84]. This avoids mixing up of new and old records as they are stored in different sections.

Storage of X-ray Films and Pathological Laboratory Preparations

As mentioned earlier, these photographic film records are so large and in some developed countries, they are stored separately from the patient's file. The main point is to ensure that the X-ray file remains intact and does not get torn or worn out.

This is ensured by using high quality envelopes. As they are important forms of a patient's medical treatment, they are kept in the patient's file in Kenyan hospitals. They should be stored in clean, well-ventilated, dry (40-50% relative humidity), cool conditions, with a room temperature of about 15-27 degrees. They last on average 15-20 years [6, 84].

Electronic Hospital Records

The use of electronic medical records allows access to other records like casenotes as well as all other patient related material that is helpful in their health care [6, 101]. In Kenya, paper-based files are scattered all over the hospital departments and care facilities thereby risking the care given to patients.

The fact that the patient carries the prescription to the pharmacy is a major concern as most times, the hospital visit card gets lost and it is hard to follow up on the healing process. At other times, the handwriting is invisible and the personnel at the pharmacy have to figure out what is exactly written.

The introduction of computerized medical files will also enhance hospital appointments, an area that the health care system has failed to properly carry out. This also encourages referrals as the specialists from other centers are able to access the patient's files easily and at their own comfort [6, 102].

5 METHODOLOGY

In the methodology of this paper, various sites and sources were thoroughly analyzed and the information used in the development of this paper in order of relevance. Each article was read thoroughly and the information categorized according to the topics to make the paper more enriched with facts.

This also helps to show how and why the manual record keeping type of filing in Kenya should be revised. The research done showed immeasurable benefits of computerizing hospital records and why manual record keeping in hospitals is hard during follow up and inaccurate.

| Location | Name of Article | Author | Year |
|-------------------------------------|---|---|-------------|
| <i>Introduction</i> | Electronic healthrecordoverview | National Institute of Health, National Center of Research Resources | 2006 |
| <i>Introduction</i> | What are computerized medical records | Ellis-Christensen T | 2003 |
| <i>Introduction</i> | Computerizedmedicalrecords | William W. Stead William E. Hammond Ph. D | 1983 |
| <i>Background</i> | The CaseBook Projects: A digital edition of Simon Forman's and Richard Napier's medical records 1596-1634 | Dr. Lauren Kassell Dr. Michael Hawkins Dr. Robert Ralley Dr. John Young | 2012 |
| <i>Background</i> | Health Information Management (HIM): Past to current day | Denise Van Fleet | 2010 |
| <i>Background</i> | Legal medical records standards | Corporate compliance policies and procedures | 2011 |
| <i>Theoretical Framework</i> | Managing Hospital Records | International records trust | 1999 |

| Location | Name of Article | Author | Year |
|-------------------------|--|--|-------------|
| <i>Content Analysis</i> | The qualitative content analysis process | Elo and Kyngäs | 2007 |
| <i>Content Analysis</i> | Computerized patient records, electronic medical record and electronic health records | Michael R. Kauka | 2012 |
| <i>Content analysis</i> | Barrier to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions | Albert Boonstra-MandaBroekhuis | 2010 |
| <i>Content Analysis</i> | The electronic medical records: promises and promises | William R. Helsh | 1995 |
| <i>Content Analysis</i> | Evaluation of computerized health management information system for primary health care in rural India | Andand Krishnan BaridalyneNongkynrih KapilYadav Satyavir Singh Vivek Gupta | 2010 |
| <i>Content Analysis</i> | Impact of electronic medical record on physician practice in office settings: a systematic review | Francis Lau Morgan Price Jeanette Boyd Colin Partridge Heidi Bell Rebecca Raworth | 2012 |
| <i>Content Analysis</i> | Computerization of medical records | James A. Christopherson | 2009 |
| <i>Content Analysis</i> | Large-scale computerization- The cure for the health-care crisis | Bruce Sundquist | 2006 |

Table 1: Article List

In the table above, each article is named, the author is clearly named and the year of publication of the article indicated. The location section refers to the section in this paper in which the information from the articles named above has been used.

5.1 Content Analysis

Content analysis is used during research for compiling all the information gained thus providing awareness through representing the facts. This gives deeper discovered insights through which courses of action can be drawn.

The aim of content analysis is to clearly present all the related data to the research being conducted and analyze the outcome of all the collected data. This helps in proving the relationship between the phenomenon researched and the results attained. [7, 1]

This method provides a large variety of information from which different facts can be tested and proven. This gives a quantitative measure of the theory at hand. The only drawback of this method is that there is no clearly defined way of carrying out the content analysis so there no exact boundaries when carrying the research out [7, 1].

The main category of the content analysis of this paper has been derived from the research questions as presented in the tables below:

Question 1: What are the benefits of introducing a computer-based system in the Kenyan health sector?

The benefits of computerization of medical records can be categorized into two main sections. They are data analysis and accessibility. They are shown here below:

| SUB CATEGORY | GENERIC CATEGORY | MAIN CATEGORY |
|--|----------------------|---|
| <p>--Computerization of medical records guarantees an interactive report through which data analysis is simplified in comparison to paper-based records. It ensures the safety of the record and avoids misplacement or loss of important information. It is also useful for future references.</p> | <p>Data Analysis</p> | |
| <p>--The computerized medical system of record keeping is advantageous in that the data is accessible to other medical centers and facilities all over the country. This rids miscommunication through telephone conversations or other internet communication channels. The data is clearly indicated and updated and this solves lots of money and time.</p> | <p>Accessibility</p> | <p>Benefits of introducing computer-based system in the Kenyan health sector?</p> |

Table 1: Research Question 1: What are the benefits of introducing a computer-based system in the Kenyan health sector?

Question 2: What are the barriers of computerization of healthcare records to be expected in Kenya?

There are several barriers to electronic medical records. They include financial, time, organizational, legal, social, psychological, technical and change process. They have been illustrated in the table below:

| SUB CATEGORY | GENERIC CATEGORY | MAIN CATEGORY |
|---|------------------|---------------|
| - Governments face a high budget when introducing computerization to their health care system. Both the start-up costs as well as ongoing costs take a while to compensate for. The Kenyan medical system would take highly skilled computer engineers to come up with a running and stable hospital system that would cater to its large population of over 35 million inhabitants. Much education is necessary to educate the personnel on proper operation of this system. | Financial | |
| -The system's stability is of utmost importance to avoid spending too much | Technical | |

| SUB CATEGORY | GENERIC CATEGORY | MAIN CATEGORY |
|--|----------------------|--|
| <p>time operating the computers as compared to the time allocated to patients. Patient safety should be guaranteed so that the confidentiality of files is observed by correct coding of the program.</p> | | <p>What are the barriers of computerization of healthcare records to be expected in Kenya?</p> |
| <p>- The data should be retrieved and updated in real-time to avoid wastage of time. This would motivate the personnel to support the introduction of this system. The time taken for the project to be stable also influences the acceptance of the project among health care personnel in Kenya.</p> | <p>Time</p> | |
| <p>- Cultural barriers in Kenya are the most important factors that must be addressed when implementing such a system. Other factors include personal preferences and the opinions of the personnel regarding revamping the medical system.</p> | <p>Psychological</p> | |

| SUB CATEGORY | GENERIC CATEGORY | MAIN CATEGORY |
|---|------------------|---------------|
| <p>- Health care is teamwork and that means that all individuals must feel confident in their computer skills to be able to operate this kind of system. The government and the health care facilities must provide some kind of educational tutorials to guarantee this.</p> | Social | |
| <p>- The personnel must be educated on the importance of the computerized medical filing system so that information entered into the system does not breed legal problems.</p> | Legal | |
| <p>- The advantages of this system must be outlined for the personnel to accept this new system. The personnel must accept that this system would ease their work and they should be motivated to voice out their concerns before taking up the project.</p> | Organizational | |
| <p>- The issue must be approached with alot of patience as It is usually hard to change such a system</p> | Change Process | |

| SUB CATEGORY | GENERIC CATEGORY | MAIN CATEGORY |
|---|------------------|---------------|
| that has been in use since the creation of medical facilities in Kenya. Every party must be given enough time to adjust and that includes the government that foots the bill, the personnel who get to use it daily as well as the patients who get their information widely availed. | | |

Table2: Research Question 2: What are the barriers of computerization of healthcare records to be expected in Kenya?

6 RESULTS

In this chapter, the author further discusses the results that come forth from the articles below. The results are sub-divided in two parts in relation to the two research questions as reflected below.

6.1 What are the benefits of introducing a computer-based system in the Kenyan health sector?

(Results for research Question 1)

In Kenya, medical personnel spend about 40% of their time recording and reviewing patient activities. Part of it is due to missing records while part of it is due to incomprehensible records. When a patient comes to the hospital, the nurses in charge often try and get the patient's documentation for review purposes before treating a patient.

The time taken to retrieve records is too much and sometimes, if the nurse cannot really find it, a new record has to be created. This means that the treatment process of the patient is compromised because of the medical records filing system currently in operation.

Other factors are as follows:

Data Quality

The reliability of data is a big alarm in Kenyan health care systems. The amount of patients with the same name and the lack of personal identity numbers give hospitals a lot of problems in retrieving records and identifying the correct patient.

The fact that the hospital system is also not categorized into the patient's location of residence also renders access to the patient's data impossible as these data are stored manually. It is almost impossible to get data from other departments in the same hospital unless the personnel physically visit the departments to get the records.

If the patient remembers all the medical procedures and treatment plan, then it tends to be easy. However, given the cultural backgrounds of some tribes in Kenya, some things are banned and the patient may hide some information to protect their pride. This is why the health care personnel cannot always trust what the patient says.

Computerization would allow for connection between hospitals and save the inaccuracy experienced in patient care. The data would also be timely and updated regularly to give a clearer image of the patient's health condition during each hospital visit.

This will greatly save money and time for the health care system and make work a lot easier. It will also save the patient a lot of time and improve the treatment process as the personnel can review what illnesses the patient has previously suffered and what kind of treatment worked for them.

This also improves the working of the hospital so that if some blood tests are ordered at the ward, then the laboratory knows in advance exactly what kind of tests to run and their urgency. This will avoid gaps in the treatment process which are always experienced when the responsible personnel forget to write this down or when the patient forgets what has been instructed. When the health care personnel that treated the patient goes home, there is no way to get the records back and there is no way to get the care plan. Other personnel taking care of the patient will have to redo the care plan and it might differ from the previous one. This goes against evidence-based care.

Accessibility

Unlike the current paper-based records in most Kenyan health care facilities, electronic medical records bear the advantage of being accessible to all the health care personnel at any health care facility in the country [8, 771-776]. This is an advantage because should the patient fall sick away from his permanent location of residence, his medical history is available to the health care personnel. Most times, when patients visit a new health care facility, they can hardly remember their illnesses in the past 6 months and there is no access to their records. If the patient omits some important information, owing to forgetfulness or cultural beliefs, then there is a risk of misdiagnosis and improper treatment.

This interactivity is very important in solving mysterious diseases. Most times, a patient suffers from a condition that doctor's in Kenya try to treat in as many different ways as possible in vain. No matter how much they try to get a solution, it doesn't work.

If this information were accessible all over the country, it would be easier for doctors to liaise with professionals in health care who are able to analyze this data and come up with a treatment plan that could solve the mystery. This is especially the case in the specialty units or with very experienced doctors. This encourages consultancy among health care personnel instead of just referring the patient to other facilities. In paper-based records, some information could be missing or there could be a barrier in telephone conversations rendering this process cumbersome [9, 3].

6.2 What are the barriers of computerization of healthcare records to be expected in Kenya?

(Results for Research Question 2)

Despite the positive effects of electronic medical records usage in medical practices and how they can benefit the Kenyan medical sector, the adaptation rate of such systems barred by various reasons. First up is the hesitation from the health care personnel to change their way of working.

Secondly, the government is not ready to take up such a project because it will take a couple of years to get everything right. The financial situation does not allow for such radical changes in the health care sector especially because the starting budget would be well costly and until the system stabilizes, the cash flow into the project would be quite heavy.

Also among the most important barriers are cultural backgrounds and the system's security. The barriers can be categorized as shown below.

Financial

This is one of the major concerns, especially in a developing country like Kenya. The lack of finances and facilities is part of the reason the health care system is currently paper-based. The government expects to work with the lowest budget possible to achieve highly productive systems.

The costs involved are: the start-up costs and ongoing costs. The start-up costs will include the costs of the machines, the skilled manpower to code the electronic medical record program as well as its back-up files. All other programs added to support this electronic system for record keeping is included here in the start-up costs [10, 1].

Updating the system and all the security maintenance required to keep the system going is considered as the ongoing costs. Educating the staff is also considered as an ongoing cost as it is a recurring event [10, 1].

Technical

The computer program should be coded so that that unique is not transferable and cannot be used by more than one patient. The coding team selected to come up with such an electronic medical record should be very skilled to rid the program of any bugs and anything else that would render it inadequate. Security should be of major concern to enhance patient confidentiality and when designing the rights of the personnel, special attention should be observed to discourage misuse of the patient information.

Personnel must be given enough educative seminars to ensure that they use the system correctly and that data is stored in the right manner. The electronic medical record keeping is a complex system that should be used carefully to avoid entering wrong details that would lead to misdiagnosis.

The system should be updated without affecting the already stored files to avoid redundancy. The system must be very reliable as it contains very important information and personnel must be able to see this function in order to support its integration.

Time

The time it will take to completely get the computerized system up and running is a major concern. As stated in this paper, in Kenya, the medical system is such that there are very few appointments. The majority of the patients come without any arrangements and there is always a queue at the out-patient department. If this computerization process takes too long, personnel will be hesitant as they rarely have enough time to spend with the patients. They would preferably spend time with the patient than trying to figure out how to enter the details of the patient into the computer records.

In Kenya, the task would be way too huge if the plan is to transfer all the paper-based records to the computerized system. Some of the records may be missing or detached and so it would be more ideal to start the system from scratch. Each incoming patient would have their records created freshly and a unique personal identity issued to them. The patients who are already in the hospital can have their details easily input in the computer.

Psychological

Personality, emotions and perceptions must be taken into consideration when trying to introduce computerization of health records in Kenya. Another major influential factor is culture that varies greatly in the over 45 different tribes in Kenya. There is a great cultural diversity that influences and shapes what is acceptable and what is totally unacceptable.

Professional autonomy defines all the acts of personnel that greatly influence their behavior at work. This means all the acts, situations, practices, support and outcomes of their actions in their organizational roles [10, 1].

Social

Health care is a perfect example of organizations that base their work on teamwork. All members of this team are important entities and affect each other's work. There has to be a unified mission to improve health care.

The organization should organize a lot of seminars to educate the personnel technically to make computerization of health care records work. This will avoid complaints of workload for the ones whose technical skills are excellent, as they would have to work hard to rectify the mistakes of their counterparts [10, 1].

Undermining of specific personnel's technical skills will not be encouraged, should there be enough seminars that educate the health care personnel from time to time. This

would also reduce negativity among workmates and hesitation to adopt computerization in hospitals.

Legal

This is where the quest for security is important. Using computerized medical records should be very secure to avoid breaching patient confidentiality through unlawful use or hacking the system [10, 1].

Health care facilities need to be assured of this security before adopting these computerized systems as it could lead to major legal actions.

There has already been unlawful use of paper-based record and the only advantage that this has over computerized systems is that the paper-based files are stored in a library so one would need to make that effort to physically visit the library to search for the file. This monitors unauthorized entry into the library. In a computerized system, one could simply gain access by a simple click of the computer. [10, 1]

Organizational

Physicians in larger practices, especially the government hospitals in Kenya would need more integrated health record filing systems to accommodate their diverse departments. Smaller or family-owned practices could very well operate without computerized systems as computerization would be quite costly for them [10, 1].

However, due to their involvement in patient care, especially in areas where the proper hospitals are scarce, they are the only option. They therefore need to also revamp their systems to support the promotion of health.

Change Process

Changing the whole medical system in Kenya would be very difficult as it would face so many barriers, as discussed in this paper. Implementation of electronic medical records in medical practices amounts to a major change for personnel and as always, change is always a long process. It would take many seminars to show the health care personnel how advantageous computerization of health care system would be.

However, there would still be hesitation as they would need to be convinced that this process would not make their work harder. In case there is doubt that the system might fail, as is always the risk with everything else, the motivation would be so low making the process take longer than necessary to introduce and integrate. [10, 1]

7 DISCUSSION, SUGGESTIONS AND CONCLUSION

Medical records have held importance in the healthcare field for centuries. Medical practitioners deem it necessary to record all their encounters with every single patient they treat. Physicians treat many patients in a day and therefore every visit should be recorded before the next patient is allowed to get in and this will also minimize the risk of mixing up patients. This will also be advantageous should the patient visit again for follow-up or in case of complications.

In Kenya, the widely used method of keeping records on paper which has been used for a long time has been failing to produce evidence-based care. When dealing with over 300 patients in a day without appointments, the medical staff has really no time to keep searching for records of patients without a proper identification code of patients. It takes too long to search through all the records and there is always a hurry to allow for enough time for the all the patients to receive treatment.

There have been some disadvantages to this system. One of the major disadvantages is that the records get easily lost as a paper could simply fall from the folder and end up being misfiled. In that case, the record is lost and inaccessible.

Another disadvantage would be misspelling of medications and signs and symptoms. This could lead to misdiagnosis. Another common occurrence is when the personnel at the hospital cannot clearly see the handwritten document and end up giving the patient the wrong medication.

Patients take their health card home with them and when visiting next, these records could have been misplaced or lost. This renders follow-up almost impossible. Knowing the details of the past visits becomes vague or unknown and it may hinder patient care. Physicians also value their own notes; this is because they are able to follow up on their patients and gives them a sense of security and they know that they are responsible for the notes they write.

Suggestions

Proper computerization of health records is a problem that many countries have had to deal with to ensure patient safety and evidence-based care. It has also served the purpose of minimizing the complications that come up from misdiagnosis, including legal hospital lawsuits. Most developed countries have managed to come up with arguably workable solutions.

However, their counterparts in third-world countries are yet to get there. Lack of finances and technological facilities still continues to be one of the leading causes as to why adoption of electronic medical records is still lacking.

Pre-filled forms are unavailable sometimes also due to the fact that health care is in itself a business. Surgeons, for example, who may undertake risky procedures that are unheard of, may have to read so many surgical guides and try many times before inventing a new surgical procedure. They may never want to let out their secrets so that they ensure that they are the only surgeons who know what is to be done. They may refuse to impart knowledge to update the already available pre-filled forms in fear that someone might pick the idea up from such pre-filled forms.

This also goes for other specialties and in Kenya, this pride is mostly experienced when the country is facing pandemics. There is always some doctor who treats patients well and will impart knowledge only when he is given some sort of accreditation for his problem-solving efforts.

Kenyan hospitals could benefit from a simple framework that deals with the very basic information which will ensure as many registrations as possible. This could be done in an inter-departmental level to first deal with the basics of entering the personal data in the computerized system. Such a system would contain the following: name, age, sex, location and a special patient code that is unique to him. The form could be based on the department so that if it is the X-ray department, there are possibilities to review the images taken.

This could take a couple of years to get adopted and appreciated but after this, then it would be easier to retrieve patient data and the files would be updated. Then, other options like inter-departmental relationships could be drawn and finally, relationships to other health care centers and hospitals could be considered.

Other important information like blood groups, all the diseases and medications of the patient, allergic reactions and dangerous infections should also be clearly indicated and visible to all health care facilities in case the patient comes into the emergency unit.

Conclusion

Medical records serve a couple of purposes. Documentation is important in providing proof of treatment and medical examinations performed. This is important when it comes to dealing with insurance companies and also case of legal issues, the information can be availed.

A patient's medical record is very important in drawing care plans and determining the course of treatment. This is where computerized hospital records are of utmost im-

portance. In Kenyan health sector, a patient's paper-based medical information may not be easily retrieved. If the patient has not been to the health care facility for the last couple of months, the main practice is to create a new one as it takes too much time to get the exact file from the hospital's library. There is not usually enough time to search the files as there are many patients who come into the out-patient department without appointments.

The other important advantage of have medical records computerized is that it is possible to carry out research. Every disease manifests itself differently in every patient. There are new diseases that come up and for cures to be developed, it is necessary that research is carried out. In case of disease epidemics, medical records can be used to sample the signs, symptoms and effects in many patients, therefore helping in drawing up care plans and vaccines where necessary.

Another advantage is that the doctors of all major departments can review all the important patient data before drawing up a care plan. Accessibility to laboratory reports, X-rays and all other tests would lead to a better idea of the illness for the doctors. Most times in Kenya, the doctor will request new tests to be taken. This is an unnecessary added cost to the patient as those very records might have been taken a couple of weeks back but cannot simply be accessed.

Major concerns would be confidentiality and security risks. However, there should be legal documentation provided at the beginning of employment to remain professional throughout the employment period. Furthermore, in Kenya, there are way too many patients queuing that there would never be enough time for the health care personnel to get into mischief.

Another major concern in Kenya would be if the system crashes or there is no electricity in a region, data accessibility will be hindered. There would therefore be need for backing up medical records and installing generators in all the health care facilities to avoid such misfortunes. The security of such medical records and update to the computer sys-

tems should be handled and integrated well enough to avoid losing the patients' information.

An example of a complete computerized system that would be created in Kenya is shown in appendices section. See appendix 5.

8 APPENDICES

8.1 Appendix 1: Sample File Cover

| | |
|--|--------------|
| | Hospital no. |
| | Surname |

CONFIDENTIAL

PROPERTY OF KENTALI HOSPITAL, ASABWE

| | |
|-----------------------------------|---------------------------------|
| Allergies and other-sensitivities | Years of attendance at Hospital |
| | |
| | |
| | |
| Blood Group | |

8.2 Appendix 2: Sample Summary Sheet, part 1

| | | |
|--|----------------|--|
| Name | | Hospital number |
| Address | | Change of address |
| Telephone | | Telephone |
| Change of address | | Change of address |
| Telephone | | Telephone |
| Date of birth <i>Please write APPROX if this is an Estimate</i> | | Nationality ASABWEAN/OTHER <i>If OTHER please state</i> |
| Sex M/F | Status M/S/W/D | Religion |
| Occupation | | |
| Next of Kin | Name | |
| Relationship to patient | Address | |
| | Telephone | |
| Change of next of kin | Name | |
| Relationship to patient | Address | |
| | Telephone | |

8.3 Appendix 3: Sample Summary Sheet, part 2

| | | | |
|-------------------------|----------------------|-------------------------|---------|
| FIRST ADMISSION | | | |
| Dateadmitted | Provisionaldiagnosis | Physician | |
| PrincipalfinalDiagnosis | | Secondaryfinaldiagnosis | |
| Discharged (date) | Died (date) | Length of stay | Codedby |
| NEXT ADMISSION | | | |
| Dateadmitted | Provisionaldiagnosis | Physician | |
| PrincipalfinalDiagnosis | | Secondaryfinaldiagnosis | |
| Discharged (date) | Died (date) | Length of stay | Codedby |
| NEXT ADMISSION | | | |
| Dateadmitted | Provisionaldiagnosis | Physician | |
| PrincipalfinalDiagnosis | | Secondaryfinaldiagnosis | |
| Discharged (date) | Died (date) | Length of stay | Codedby |

8.4 Appendix 4: Sample Appointments Grid

APPOINTMENTS

Patient's name: _____

Hospital identification number: _____

| Date | Clinic |
|------|--------|
| | |
| | |
| | |
| | |
| | |
| | |

| Date | Clinic |
|------|--------|
| | |
| | |
| | |
| | |
| | |
| | |

8.5 Appendix 5: Sample Database Structure

The database structure for the Kenyan medical system has to be kept very simple to cut down on costs. This will also help in assessing the efficiency of the system and making changes to minimize the risk situations.

Databases are mostly created from the very beginning as they do not have any tables, indexes or data stored. It is possible to create tables and indexes and this requires a deep knowledge of the SQL language. Databases can be created from scratch or installed using JavaScript syntax for example. Through this, data can be encrypted or decrypted at any time [14, 1].

Indexes are not used directly for storage of data. They can be used by the database to speed up the search operations. The table and field to be indexed can be defined and this will help in reviewing this information later on. One can also define whether the information is indexed in ascending or descending order.

The Kenyan database to index should be in such a way that the index is unique to ensure that data cannot be duplicated. This will help in ensuring that even people who share the same exact name have unique userid which will be a great help in the filed medical records. The field to index can be defined as the age or surname in either ascending or descending order. All data is stored in the same database file, no matter how many tables you use. The main structures that would benefit Kenya would be tables and indexes.

8.5.1 Tables

In tables, all fields and columns will be stored. This is where the data of the database is stored and accessed from.

8.5.2 Fields

These are the definitive items of the database structure. They give more information of the table items that are created. They can be categorized in three, according to their type:

- ❖ Text

- ❖ Numeric
- ❖ Blob

Text- The field is strictly for storing data types and strings in text and does not allow for numeric items.

Numeric- Allows for use of numbers and floats in storage of data.

Blob-It is very useful in storage of media and pictures or any other kind of binary data in the SQL. [14, 1]

For example: The table created would be named patients. Fields are used to give further information of the patients and could include information such as name, age, sex and address or location of the patient. All these information is stored in rows or records in the main database and can be accessed as often as need be.

Using the database schema, the coding team can access commands used in the SQL to create the files.

8.6 Hardware requirements

The hardware requirements of a hospital are very important aspects in health care. This will be the base of all operations within the hospital and thus the hardware must be operational and well taken care of.

The main features of the hardware requirements that would be beneficial to Kenyan medical care are:

- ❖ **Compatibility-** The hardware must be compatible with other machines and devices such as the X-ray machines.
- ❖ **Portability-** It is a well-known fact that most medical operations take place in the patient's room or on the corridors, where lots of first aid is required. Clinical roles, doctor's rounds and most of the nursing duties like follow-up of the vital signs of a patient happen outside the doctor's office or the nurse's workstations. A computer-on-the –wheels will be important to ensure that the personnel record

the data timely and avoid making mistakes in recording data. It also saves time. In Kenya, such a computer could also be used in more than office. Due to lack of funds, machines can be shared sometimes to save time as the number of personnel is quite high and the government of Kenya cannot provide sufficient computers. Other stationary computers can be used in main offices like the registration office, the major doctor's offices and other departments like X-ray and surgical departments.

The server of the hospitals must be very well protected to ensure that the hospital's operations run smoothly. The RAM size must be as huge as possible. A good SQL relational database version coupled with well-sized hard drives are also required. An anti-virus that is viable and well protective such as F-secure should also be installed. A properly selected operating system could be chosen in accordance to the experiences of the personnel. Mostly, in Kenya, many people would go with Microsoft windows as it is easy to operate. Other helpful programs would be the windows package which provides for important programs like excel, word and PowerPoint. Fast Ethernet companies in Kenya can finally be considered as the data needs to be stored and manufactured in real-time. The hard disk space should be sufficient to provide for all the personnel.

8.7 Software requirements

The main consideration in software provision would be the security. A really good software for inputting and storing data should employ the use of a unique username and password for each member of the health care personnel team so it is easy to trace back every single recording in the patients file. The system should be simple enough so that the personnel in the Kenyan health care system can learn how to use the system really fast. In such a system, the patients could be sorted by name. In the patient's file, there should be all information regarding his medical history, age, date, course of treatment employed, signs and symptoms, special notices like allergies and medications currently used by the patient. Then there could be other classifications such as departments and hospitals, scheduled appointments to reduce the queue of patients, lab results, admis-

sions and discharge organized by date and billing information to make calculations easier.

These data can be indexed or hashed so that the information is easier to retrieve and access.

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