

**DEVELOPING GUIDELINES FOR THE DIGITIZATION OF MANUAL MEDICAL
RECORDS AT ENTEBBE REGIONAL REFERRAL HOSPITAL**

**A PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENT FOR THE AWARD OF A BACHELOR'S DEGREE IN RECORDS AND
ARCHIVES MANAGEMENT AT MAKERERE UNIVERSITY**

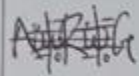

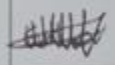
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DECLARATION

As a group, we declare that the information presented in this research project report is our work and has never been submitted to any institutions of higher learning for academic purposes.

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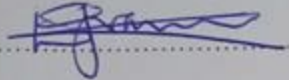
GROUP M

NAME	REGISTRATION NUMBER	STUDENT NUMBER	SIGNATURE
AKELLO ROSE GRACE	1900728717	19/U/28717	
KAMUKAMA DENISE PATIENCE	1900729204	19/U/29204	
NAMALWA ESTHER KATISI	1900728758	19/U/28758	
AWEKONIMUNGU SPECIOZA	1900729139	19/U/29139	A.S

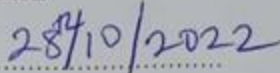
APPROVAL

As a group, we have submitted this report for examination with the approval of the university supervisor.

MR. EKWARO FRANCIS


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DATE


.....

Department of Records and Archives Management,
College of Computing and Information Sciences,
Makerere University.

DEDICATION

As a group, we dedicate this project to our fellow course mates, friends, supervisors, and all those who assisted us to come up with this research work.

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First and foremost, we are grateful to the Almighty God who gives us grace and without His blessings, we cannot think of breathing and learning. We have seen His move not only during this research project but also throughout our education life. We would also like to appreciate Entebbe regional referral hospital for all the assistance given to us in terms of allowing us to carry out our research in the hospital, data collection, field related and educative support delivered to us for the successful completion of this research project. We would also like to extend our heartfelt gratitude to our supervisor Mr. Ekwaro Francis for his professional assistance and guidance from the very start of this project to its final stage of submission irrespective of his busy schedule.

We also want to extend our sincere acknowledgment to each group member for being supportive and dedicated to the assigned roles despite all their limitations.

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LIST OF ACRONYMS

EASLIS---East African School of Library and Information Science
ERRH ---Entebbe Regional Referral Hospital
MRO---Medical Records Officer
RO---Records officer
MRA---Medical Records Assistant
DHIS2---District Health Information System
ICT--- Information and communication technology
PDF--- Portable document format
TIFF ---Tagged image file format
COVID-19---Coronavirus disease
EHRs---Electronic Health Records Systems
ISO---International Standardization Organisation
MOH---Ministry of Health
PHR---Personal Health Records
EPR---Electronic Patient Records
EHR---Electronic Health Records
PPI--- Pixel Per Inch
DPI---Dots Per Inch
CD-ROM---Compact Disc Read-Only Memory
OCR---Optical Character Recognition
EDMS---Electronic Document Management Systems
OPD---Outpatient Department
CCTV---Closed Circuit Television
USB---Universal Serial Bus
CCDs----Charged Coupled Devices
NIN---National Identification Number
AMS---Application Management Systems
UNESCO---United Nations Educational, Scientific and Cultural Organisation
ODS---Operational Data Store

ABSTRACT

This study was conducted in Entebbe Regional Referral Hospital in the medical records department focusing on developing guidelines for the digitization of manual medical records. The study was based on different objectives like to find out the types of records generated, received, and kept, to find out the criteria to be used in the selection of manual medical records for digitisation at especially the medical records department, to examine the technologies and equipment that can be used for digitization of manual medical records, to examine the challenges that can be faced during the digitization of manual medical records and to develop guidelines for digitizing manual medical records at ERRH.

The study was conducted using a case study research design that is qualitative approach and data was gathered from a sample of 6 respondents selected purposively from hospital departments staff like the medical records department, inpatient and outpatient department using an Interview guide and observation guide. The study found that there were no clear guidelines and manuals followed in the digitisation of medical records at the records department of ERRH which failed to initiate their digitisation system, misallocation of medical files, and, large volumes of backlogs in the office spaces. In addition, the department also experiences other challenges which include; understaffing, inadequate storage and inadequate skills possessed by staff and this have greatly impacted the efficiency and effectiveness of health records management in the hospital.

The study proposed some solutions to confine the challenges experienced, including training records management staff, provision of adequate funds, recruitment of qualified staff, and purchase of standardized equipment. The above study results equipped us with information that we used to develop a digitisation manual that consists of well-established guidelines that will facilitate the efficient and effective digitisation of medical records at the records department of ERRH.

The project resulted into Developing Guidelines for the Digitization of Manual Medical Records at Entebbe Regional Referral Hospital

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter presents the background of the study, area of study, problem statement, the purpose of the study, objectives of the study, research questions, scope of the study, significance of the study, and definition of key terms.

1.1 Background of the study

For the past years, digitisation has found its way into records and archives management and has become a frequent activity in many record centres and registries. Nowadays digitisation is a new method for records and archives management to keep documents for further lifetime existence. Digitisation can increase accessibility creating more ways to present records to new and wider audiences (Azim, et al, 2018). The advent of information and communication technologies (ICTs) for more than half a century has made records management go through different developments and transformations of many new ICT supported services digitisation not being exempted. A record is defined as stored information made or received by an organisation with evidence of its operations and has value requiring its retention for a specific period.

Digitisation is the process of placing tangible real-world items into electronic format by use of digital cameras, flatbed scanners, and other computer technology to create virtual items. The digital format gives the subject longevity beyond what the original item would have been. Several reasons for digitization have been identified such as; digital records can be stored on electronic storage devices and thus reduce the need for physical space while promoting strategies for vital records protection (Hoppe, 2017).

Digitisation is also crucial to data processing, storage and transmission because it allows all kinds and formats of information to be carried with the same efficiency intermingled unlike analogue data, which typically suffers some loss of quality each time it is copied or transmitted. Digital data can be propagated in theory with absolutely no distortion. This is why it's most favourable for preserving information for many organisations around the world.

Digitisation has become a practical necessity and reality with technology interventions to provide improved access to information, preservation, and dissemination as required at anytime, anywhere,

and any place (Azim, et al, 2018). The output of the digitisation process is an electronic document that can be hosted on the internet or intranet. The electronic document may be in Portable Document Format (PDF) or Tagged Image File Format (TIFF). PDF format is usually used to store information on the web as the file size is relatively small, easily downloadable, and transferable (Nneji, 2018). PDF also has a unique print or display format but is the same on any platform and can be read using Acrobat Reader (Roslan, 2018).

Today, many forces are driving the development of digitisation which include rapidly advancing technology capabilities and the increasing expectations of users. As early as the 1960s, Hospitals began to adopt information technology until the past decade when the adoption of electronic health records became widespread. Concerning the most current events, the COVID-19 virus attack in 2020 caused a crucial impact on the development of digitisation of manual medical records in most hospitals in Uganda as well as an impact on the hospital's services. There was an increased demand for health care services as well as the hospitals need to adopt new methods of delivering services to the users. Hospitals worldwide are becoming digital conscious in response to the global exchange and also for wide outreach.

The world over, electronic resources are becoming preferred because of their benefit of wide outreach (Hoppe, 2017). However, since Uganda is a third-world country, it is still a challenging issue (Roslan, 2018). This can be worked upon by improving the guidelines for the digitization of manual medical records for efficient and effective service delivery to users.

1.2 Background of Entebbe Regional Referral Hospital

Entebbe Regional Referral Hospital is a public hospital funded by the Uganda Ministry of Health. It was originally built by British colonialists in the 20th century as an Entebbe hospital. The hospital closed temporarily in December 2013 due to reconstruction work. Between December 2013 and May 2016, the hospital was rebuilt and expanded from 100 to 200 beds at 22.2 billion donated by the World Bank. The new facility has both a private and public fee-for-service wing. Other services include pediatrics, radiology, laboratory, maternity, immunization, general surgery, orthopaedics, and operating rooms. Patients served come from districts of Wakiso, Mpigi, and the neighbouring islands of Lake Victoria.

The hospital featured prominently during the two COVID-19 pandemic waves in Uganda, one in 2020 and another in 2021. According to Dr. Moses Muwanga, the Medical Director at one time during a second wave, the 200-bed hospital had 160 COVID-19 patients.

Mission

To provide the highest possible level of specialized health care services to all people in the Central and southern region including Entebbe International Airport, very important persons (VIP) areas, and Lake Victoria Islands through the delivery of preventive, curative, palliative, and rehabilitative health services at all levels.

Core Values

Members of the Organization are expected to understand and use the acronym CHOPSTICKS in their work:

- Client Satisfaction.
- Hard work.
- Open Communication.
- Proactive.
- Supportive.
- Teamwork - Timely and Responsive.
- Integrity.
- Continuous improvement of ourselves, services, and systems.

Vision

A centre of excellence in specialized healthcare, training, and research in Entebbe Referral Hospital

1.3 Problem Statement

In Uganda, the bulk of records still exists in paper format yet efforts are necessary for strengthening the management of both paper and electronic records. It is clear that paper medical records manual processes, as well as electronic health records, pose significant challenges and hindrances for healthcare organisations like Entebbe Grade B Referral Hospital, which the current COVID-19 crisis will have highlighted more now than ever. More often, these challenges can have a direct impact on the quality of healthcare being provided to the patients with serious consequences. Digitising

information assets or the so-called records is seen as a new strategy for organizations nowadays towards modern dynamic conceptualized services (Azmi, 2021).

Digitisation of patients' health records offers many advantages over traditional ways of keeping patients' records such as; easing data management and facilitating quick access, and real-time treatment. Electronic Health Records are a rich source of information for research for example in data analytics though it carries a risk that the published data or its leakage can compromise patient privacy (Anjum, 2018).

Therefore, it is important for information professionals who are involved in digitisation work to be aware of the real challenges that they may encounter during the process of digitisation (Azim, 2018). Failure to react to the above-mentioned advocating will lead to the ineffectiveness of the organization's digitisation strategy. Entebbe Regional Referral Hospital serves over three million people from within Entebbe municipality, Wakiso, Buvuma, Mpigi, Butambala, and Kalangala districts. All this leads to the generation of many records which can pose challenges during the digitisation process as discussed below.

Indexing and metadata capture challenges can lead to; loss of records, and wrong file format making it difficult to open documents on different media. Obsolescence of technology nowadays as we know is a major challenge for users (Azim, 2018).

Poor technology leads to poor quality image and security breaches lead to loss of privacy. In addition to that, inadequate infrastructure and equipment, lack of quality control measures, poor selection method, theft of records, inadequate skills, and lack of resolution standards for example whether to use 100dp, 300dp or 500dp can all lead to a poor output from the digitisation work.

Balogun, 2018 identified other issues such as lack of funding, lack of digitisation policy, lack of trained personnel, digital storage costs, time consuming, and legal requirements which prevent destruction after use. Digitisation work towards records and archives needs additional funds to support the complete project including improvement on the automation of hardware and software, as well as the expense of subscribing to all the items in terms of electronic and databases (Azim, 2018).

It is on this basis that research will be carried out to guide on how best Entebbe Regional Referral hospital can improve its digitisation of medical records to effectively and efficiently deliver its services to users in this era.

1.4 Purpose of the study

The purpose of the study was to identify challenges faced when using manual medical records at Entebbe Regional Referral hospital and propose suitable solutions, mainly guidelines for the digitization of manual medical records in the hospital.

1.5 Objectives of the study

1. To find out the type of medical records generated, received, and kept at Entebbe Regional Referral Hospital.
2. To find out the criteria to be used in the selection of manual medical records for digitisation at Entebbe Regional Referral Hospital.
3. To examine the technologies and equipment to be used for digitising manual medical records at Entebbe Regional Referral Hospital.
4. To examine the challenges that can be faced during the digitisation process of manual medical records at Entebbe Regional Referral Hospital.
5. To develop guidelines for digitising manual medical records at Entebbe Regional Referral Hospital.

1.6 Research questions

1. What are the types of records created, received, and kept at Entebbe Regional Referral Hospital?
2. What criteria should be used in the selection of manual medical records for digitisation at Entebbe Regional Referral Hospital?
3. What are the requirements to be used for digitising manual medical records at Entebbe Regional Referral Hospital?
4. What are the processes to be followed when digitising manual medical records at Entebbe Regional Referral Hospital?

5. What challenges can be faced during the effective digitisation of manual medical records at Entebbe Regional Referral Hospital?

6. What guidelines can be put in place to enable improved and effective digitisation of manual medical records at Entebbe Regional Referral Hospital?

1.7 Significance of the study

The study will help the hospital administrators, especially medical records department staff at the hospital, on how best they can digitise their medical records based on the hospital guidelines, rules, procedures, and instructions.

The study shall benefit the researchers from the award of the degree in Records and Archives Management to gain more practical knowledge on the guidelines for the digitisation of manual medical records and the challenges faced.

The study will be used by other researchers who will be interested in the topic for further research in the field of records and archives management to come up with better guidelines for digitising manual medical records in different hospitals.

1.8 Scope of the study

It presents the Conceptual, Geographical, and time scopes of the study as described below;

Conceptual area: The study focused on developing guidelines for the digitisation of manual medical records for Entebbe regional referral hospital.

Geographical: The study was carried out at Entebbe regional referral hospital.

Time scope: The study was carried out over a period of four (4) months from June to October as predetermined by the Department of Records and Archives Management, Makerere University, and also indicated in the Gantt chart.

1.9 Definition of the key terms

Guidelines

Guidelines are systematically developed evidence-based principles, rules, policies, procedures, and manuals regarding digitisation which assist providers, recipients, and other stakeholders to make informed decisions about the digitisation of medical records.

(Oxford Advanced Learner's Dictionary, 2022) defines guidelines as a set of rules or instructions that are given by an official organisation telling you how to do something, especially something difficult.

Digitisation

Digitisation is a process of converting any physical or analogue item, such as paper records, photographs, or graphic items into an electronic representation or image that can be accessed and stored electronically (Azim, *et al*, 2018).

Digitisation is the process of creating a digital image and then presenting it on a computer, local area network, or the Internet. Digitisation refers to the conversion of an item in the printed text, manuscript, image or sound, film and video recording from one format usually print or analogue into digital. The process involves taking a physical object and capturing it using a scanner or digital camera and converting it to a digital format that can be stored electronically and accessed via a computer.

Record

The Texas A&M University library defines a record of information created or received and maintained by the organisation or an individual, regardless of the media or format used to control, support, or document the activities and transactions of the organisation.

Records include books, letters, documents, printouts, photographs, film, tape, microfiche, microfilm, photostats, sound recordings, maps, drawings, and a voice, data, or video representation held in computer memory. Records are retained for administrative, financial, historical, or legal reasons.

International Standard Organisation (ISO) defines a record as Information created, received, and maintained by an organisation or person in pursuance of legal obligations or in the transaction of business, of which it provides evidence (ISO/TR 21965, 2019).

Medical records

Medical records are documents that explain all details about the patient's history, clinical findings, diagnostic test results, pre and postoperative care, patient's progress, and medication.

Physicians, nurse practitioners, nurses, and other members of the health care team may make entries in the medical record. The medical record includes a variety of types of "notes" entered over time by health care professionals such as; recording observations, administration of drugs, therapies, orders for the administration of drugs, therapies, test results, and x-rays.

Manual medical records

Smartclinix.net, 2021 defines manual medical records as paper-based documents which consist of paper files that contain the details of patient history, allergies, and previous health information of an individual. Paper-based records are normally stored in file folders and filing cabinets. Examples of manual medical records include lab results and reports from the doctor about the patient's condition.

Regional referral hospital

Regional Referral Hospitals fall under the direct supervision of the Ministry of Health. They are specialized clinical services such as medicine, surgery, pediatrics, obstetrics, and gynaecology. In addition, they deal with psychiatry, ear, nose and throat, ophthalmology, and clinical support services (laboratory, medical imaging, and pathology). They are also involved in preventive and rehabilitative services in addition to teaching, research, and technical support supervision to lower-level units (MOH, 2018).

Referral hospital

A referral hospital refers to a hospital that has sufficient resources to receive emergency or non-emergency patient transfers and referrals from a Critical Access Hospital (CAH). Sufficient resources include at least three full-time physicians on staff and licensure as a general hospital.

Hospital

A hospital is an institution that is built, staffed, and equipped for the diagnosis of disease, for treatment, both medical and surgical of the sick and the injured, and their housing during the treatment process. The modern hospital also often serves as a centre for investigation and teaching (Piercey, 2020).

A hospital is an institution providing medical and surgical treatment and nursing care for sick or injured people.

1.9 Conclusion

In conclusion, chapter one presented the background of the study, area of study, problem statement, the aim of the study, objectives of the study, research questions, scope of the study, significance of the study, and definition of key terms.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter will focus on the revision of the relevant literature. A literature review is a systematic examination of the scholarly literature about one's topic. It critically analyses, evaluates and synthesizes research findings, theories, and practices by scholars and researchers that are related to an area of focus. In reviewing the literature, the researcher should present a comprehensive, critical, and accurate understanding of the current state of knowledge, compare different research studies and reveal the gap in the current literature, and indicate what needs to be done to advance what is already known about the study (Sara EfratEfron, 2018).

The purpose of the literature review is to determine what exists in the scholarly literature, identify possible gaps in the scholarly literature for further research, inform the research topic theory (if applicable), and associated methodology, and compare against findings resulting from the current study. Appropriate journals, newspapers, books, and websites on guidelines for the digitization of manual medical records will be revised (Lonny, 2020).

2.1. Objective 1: Types of medical records generated, received, and kept

Medical records as documents that explain details about the patient's history, clinical findings, diagnostic test results, pre and postoperative care, patient's progress, and medication. If written correctly, notes will support the doctor about the correctness of treatment. Medical records are one of the most important aspects on which practically almost every medical legal battle is won or lost. This article discusses the various types of medical records (Paul and Flint, 2021).

There are different types of medical records like prescription records, reports, referral notes, discharge cards, and medical certificates(Bali, et al., 2011) as elaborated below:

Prescription

Prescription and dispensed records contain information about medicines prescribed by a healthcare provider. The records also provide details about the healthcare provider that prescribed the medicine and the healthcare provider organisation that was visited. These records may include: the medication

brand name, strength prescribed, generic medication name, dosage instructions, the maximum number of prescription repeats, the date the medication was prescribed, and the prescription expiry date.

Prescription is a formal communication from a physician or other registered health care professionals to a nurse practitioner or a pharmacist authorizing them to give out a specific prescription drug to a specific patient. The prescription must contain a space to capture the patient's name, age, sex, address, and institution or hospital's name, date, and the health care provider's signature. In the blank area, a healthcare provider will write the following directions; the medication name, the medication dose frequency, how often to take the medication, the duration of days, how to take the medication, and the total quantity or number of tablets. Prescribed drug details should be in capital letters to be visible. They should also give instructions on prescriptions of what to avoid. The health care provider may give a prescription in different ways including writing a paper prescription that a patient may take to a local pharmacy or calling and emailing the pharmacy to order the medicine.

Nahamya (2018) stated that the following should be included in the prescription book; the date on which the restricted drug was supplied or dispensed, the ingredients and quantity supplied the name and address of the person to whom the restricted drug was supplied, the name and address of the person by whom the prescription was given.

Doctor's reports

This is a written document describing the findings of the patient. It's a vital piece of evidence that can confirm and support any claim because it records the results of the medical examination of the patient. Ideally, a medical report should be completed by a doctor or medical professional who is familiar with the patient's condition and has treated the patient for a significant period. It should be dated, and signed and must be prepared with accuracy, diligence, and an understanding of basic legal principles because they may be used in court proceedings with consequences for the patient or the doctor. Clarity of communication is vital to maximizing the medical report's effectiveness. Requests for medical records are common and originate from a variety of sources such as; police, lawyers, insurance companies, and the patients themselves.

All reports such as lab investigations, x-ray reports, and Magnetic Imaging Resonance (MRI) reports should be issued by a qualified person and preferably in duplicate or carbon copy so that all parties

keep a copy and the hospital keeps the original. Common features of a report include; the date on which the report was prepared, the name of the person to whom the report is directed, the full name, the date of birth and the hospital unit where the procedure was carried out, and an indication of the author. A report should include the doctor's full name, practicing address, current employment, and qualifications. The terminology used in the report should be interpreted appropriately. Requests to edit medical reports to remove some information or details should never be accepted and a report should provide a balanced and complete account of the consultation.

Referral notes

A referral is a written request from one health professional to another asking them to diagnose or treat a patient with a particular condition. It provides information about a patient and the condition so that the doctor the patient is being referred to has fewer questions to ask, and to make the doctor aware of the relevant information. It will help the doctor to know exactly what they have been asked to do. A referral is also used to indicate that the consultation or test the patient is being referred for is clinically important. The referral note should include; the date, the relevant clinical information, and the signature of the referring doctor.

Discharge card

This is a clinical report prepared by a health professional after the hospital stay or series of treatments. The consultant in-charge should fill or supervise the discharge card. The condition of the patient on admission, the investigation done, the treatment given, and the detailed advice on discharge should be written on the discharge card.

Operation notes if mentioned have to be correct otherwise just mention the name of the operation and give separate notes in detail if asked for. If any complication is expected after discharge, ask the patient to report it immediately. Instructions while discharge must be clear and elaborative.

Medical certificate

A medical certificate is defined as a document of written evidence vouching for the truth of a fact as determined by the doctor issuing such a document. If a medical certificate is admitted in a court of law as evidence and is proved to be false, the issuing doctor is liable for punishment. It should be signed

and dated based on facts known to the doctor as well as information provided by the patient. While issuing a medical certificate, the following things should be kept in mind; they should be on an institution letterhead or doctor's letter pad, the date time and place should be mentioned, they should be issued only, when necessary, has to be true and clear, should have an identification mark of a patient preferably a thumbprint, period of illness should be mentioned, and the doctor should maintain a duplicate copy.

Categories of medical records

Medical records are categorized based on Personal Health Records (PHR), Electronic Medical Records (EMR), and Electronic Health Records (HER) (Staff, Healthwise, 2022) as elaborated below;

Personal health records

Sarwal (2021) defines a Personal Health Record (PHR) as a collection of an individual's medical documentation maintained by the individual or a caregiver in cases where patients are unable to do so themselves. This personal information includes details such as the patient's medical history, applicable diagnoses, historical and ongoing medications, including over-the-counter and alternative treatments, past medical and surgical interventions, immunization status, allergies, and other relevant medical conditions that can impact the delivery of emergency care. For example; Type 1 diabetes, blood type, whom to contact in the event of an emergency, insurance information, and contact information for the patient's regular health providers.

A PHR may be either physical or as increasingly common moving forward, electronic. It includes all self-reported and self-recorded health data including health issues, treatments, records of vital signs, activity recorded with personal devices like smart phones and smart watches, and nutritional data such as diet composition and calorie intake.

Electronic medical records (EMR)

These are used interchangeably in literature as Electronic Medical Records (EMR) or Electronic Patient records (EPR) which are part of an evolving concept involving a wide range of information systems. EMRs are computerized medical information systems that collect, store and display patient information. They are means to create legible and organized recordings and also access clinical

information about individual patients. EMRs have been described as an important tool to reduce medical errors and improve information sharing among physicians (Kubben, 2019). Each EMR is collected in an accumulated way following the clinic diagnostic procedure. It often contains various types of information including; personal information (age and sex), narrative admission notes (past medical history, history of present illness and symptom), vital signs, structured diagnostic test results, medical image diagnoses (X-ray diagnosis), billing codes, and discharge notes (Tou, 2018).

Electronic medical records are electronic files that a doctor or other providers use instead of paper files stored on shelves. The doctor types the information into the computer to schedule a search for a specific file that he or she wants to check on stored in the doctor's computer system. Keeping records on the computer is much easier than keeping paper records because the computer system also handles, billing, and sharing of hospital records with other providers outside the system (Staff, Healthwise, 2022).

Electronic health records (EHRs)

Electronic health records are built to be shared with other care providers who use the same system. For example, a family doctor can instantly send medical records to the client's specialist, to the hospital, lab, or drugstore, and to the client's device like a computer at home. Electronic health records goal is to improve the coordination of the patient's care by giving the providers accurate and up-to-date information including information from the patient (Staff, Healthwise, 2022).

An Electronic Health Record as a digital version of a patient's paper chart. EHRs are real-time, patient-centred records that make information available instantly and securely to authorized users. While an EHR does contain the medical and treatment histories of patients, an EHR system is built to go beyond standard clinical data collected in a provider's office and can be inclusive of a broader view of a patient's care. EHRs are a vital part of health IT as they contain; the patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, laboratory, and test results, allow access to evidence-based tools that providers can use to make decisions about a patient's care and automate and streamline the provider's workflow.

An electronic health record is one in which health information can be created and managed by authorized providers in a digital format capable of being shared with other providers across more than

one healthcare organisation. EHRs are built to share information with other healthcare providers and organisations such as; laboratories, specialists, medical imaging facilities, pharmacies, emergency facilities, schools, and workplace clinics.

Formats of medical records generated, received and kept in hospitals

Paper-based records

These are records that are printed out and managed on paper and are traditionally stored in vertical lateral open shelves or mechanized storage units. Before arranging these records on shelves, they have to be systematically organized in their respective file folder which eases their retrieval and use.

Paper-based medical records

Paper-based record system as the name implies involves recording patients' healthcare information using physical means like paper, and files, and storing this recorded information in physical storage facilities like file folders, shelves and cabinets to be retrieved when needed (Nwago, 2018).

Electronic records

An Electronic Record is defined as any combination of text, graphics, data, audio, pictorial, or other information representation in digital form that is created, modified, maintained, archived, retrieved, or distributed by a computer system (Michael, 2019).

An electronic record is any information created, used, and retained in a form that only a computer can process. Electronic records include email, text messages, disaster recovery backup tape, and records that exist on portable media, such as memory sticks, BlackBerry devices, or PDAs. Records related to department work that may be produced or kept on personal devices away from the office are considered state records, and are not the employee's personal property. Any state record may be created or stored electronically. Certified output from electronically digitized images or other electronic data compilations is accepted as original state records by any court or administrative agency of this state unless barred by federal law, regulation, or rule of court.

2.2 Objective 2: Criteria to be used in the selection of manual medical records for digitisation

Long before computers could wirelessly adjust collections data in seconds simply by tapping a button, they were cumbersome, labour intensive, and generally inaccessible to the vast majority of Individuals and the institution. Therefore, computer assistance in records management is to be put into consideration (Parry, 2007). The following are the criteria used in the selection of records for digitisation;

The context

The basis for selection should be of permanent value since guidelines could be assigned to several departments depending on the type of paper materials. For digitisation to take place in the information world as the data or product, a good criterion is used for the records selection putting content value into consideration (Hausuredell, 2020). It is timely for the information professional to consider the managerial intentions of records like preservation, as responsibility for drawing up selection, print materials could be used for electronic publications.

Value

Priority is given to high - value at risk materials of the organisation's interest. The delivery of digital reproduction is highly desirable for materials in this category in part to serve preventative preservation, as well as security goals, by reducing the handling of originals. This practical criterion conserves the status of materials. The use of microfilm is a stated preference or requirement for most digitisation (National Library of New Zealand, 2018).

Handling and use

Original materials that have a high frequency of demand or high retrieval costs are strong candidates for digitisation. Digital data should be organized, indexed, delivered to users, and maintained over time. Usage is another factor that determines a collection's priority for digitisation. Selection documents should support current prioritized activities, public programs, outreach activities within the hospital, and publications, enhance the strengths of the institution, and have the potential for the enduring value of digital objects. Items with pedagogical utility for the training of the staff are also ideal for digitisation. If manual records are well used, researchers will most likely also be interested in

their digital versions, conversely, under used documents may be good candidates for digitisation if they have widespread interest and a realistic expectation exists for attracting new users.

However, documents selected for conversions and hosted online, even if highly used in their manual form, are only a subset of the collection. Online aggregations of documents give the staff access to an edited view of history, rather than the more balanced perspective context from which the documents originated. Although making selection decisions based on use is tenable, doing so limits search results to the repeated use of the same documents, perhaps without proper context. Records officers must determine the sapient balance between digesting commonly used documents and providing a richer presentation of the institution's holding (Williams, 2018).

Artifacts

These include dust, scratches, and streaks which affect the quality of an image. They all create a visible non-random fluctuation in light intensity, but how this affects the image quality differs depending on the output requirements. It is advisable to use software to detect the presence of artifacts as well as visual examination (Holkeri, 2018).

Collection development/Demand

The process of deciding what to digitise anticipates all the major stages of a project. It is a significant and probably accurate process. It is important to know when data can be acquired for preservation and access if a thorough review of selection in the digitisation process has been done, and know how to ensure the integrity and responsibility for data, which needs further elaboration of some of the issues involved. Developing policies on planning checklists, ensuring that new digitising projects fulfil the expectations of the hospital, hospital staff members, administrators, researchers, and the records officers/staff, prediction of the records that will be useful in the future, and how well relevant information is captured from the original are all important (Vorzhakova, 2020).

Standards

Gamulin (2018) states that the records digitised should be available from a variety of hardware documents of suitable quality. Considering the requirements for archiving in terms of hardware, software, and preservation tools, the platform used should be supported by the organisation. He

continues and says that the software used to deliver the materials should be readily available and easy to use (it should support data migration), and metadata created should conform to agreed international standards for example Dublin Core. Standards being used should meet national and international standards yielding records that acquire print-on-paper, secure in the knowledge that such materials will continue to be available for fifty years. No such security of thought can be present therefore, have the figures immediately at hand to undertake such work of acquiring and storing print-on-paper

Administrative issues

The benefits of digitisation should justify the costs of digesting the material and making it available over the institution-wide network. The institution should have sufficient expertise to carry through the project of digitisation, create a departmental records management committee, there should be sufficient finance to meet the costs of digitisation, and provide digitized teaching materials. The digitised resource should enable the creation of a partnership with existing departments within the organisation. Ensure management of the website, and planning for the preservation of the files over a long time. Experts should not make digitisation decisions alone. For successful digitisation, the organisation's technical experts should capture metadata creation, web design, and digital asset management, and collaborate in making the initial selection. If there are no resident experts, working with consultants is strongly recommended. Furthermore, since each set of experts has its vocabulary, priorities, and principles, a successful digitisation program can be as much about the materials (Alghanim, 2018).

Durability

Consider the need to ensure long-term archiving of the technical process of digital archiving. This falls under the remit of the central texts, but also an enormous quantity of other material which sheds shafts of ability to move fragments around on the screen, avoiding damaging contact. They do so in the expectation that the originals will still be accessible in fifty years (Long-term archiving). The work of added features enhances access to damaged originals. There should be constant updating of the software used for the storage of digitized records (Barry, 2019).

Content

High-quality capture of the content according to National best practices is achieved through ensuring the creation of metadata that records technical, structural, and captures information. Preparation of materials including; physical organisation/collation, providing description and identification through cataloguing and metadata, and any needed repair or conservation work is key. Significantly, work is also required to mount electronic files, make them accessible and manage them over time. Creating the user interface with all the necessary searching and navigational tools is also important (Hauswedell, 2020).

Copyright or Intellectual property

Dickson (2021) suggests that the most important selection criterion for digitisation is the copyright status of the original materials. Images should have their copyright held by the organization or in the public domain. For images, permission to digitise must be obtained by the rights holder if the institution does not have the right to digitise them other images must be chosen. This should be considered since some of the records could be coming from outside sources (not generated within the organisation) such as training manuals or journals donated from support Instigation such as World Aids Organisation and some got from the government to be used in training hospital staff and the community members. Issues regarding intellectual property, privacy, and publicity rights can lead to lawsuits. Additionally, donor restrictions must be investigated to determine if the records can be digitally captured and presented online. Digitisation performed without careful selection may result in the creation of digital files that cannot be used due to candidate materials being a crucial step in any digital selection process.

Conversion

This means converting a record from one format to another. When converting a record, the source record is the record being converted and the converted record is the result of the conversion. The converted record should contain the full and accurate information contained in the source record. The converted record should meet the requirements of the organisation's needs, legal, financial, or any other relevant requirements. Assurance should be made if the converted record can be retained and made accessible for the long term given its preservation value. Consider the tools to be used for the

conversion processes without affecting the existence of the record. Examples of conversion include; the digitisation of a paper document, the digitisation of microfilm, the conversion of a digital record from one software format to another, and the conversion of a database to a set of Portable Documents Format (PDF) files, and a spreadsheet. The converted record should be considered an official record of the organisation after conversion. The applicable functional records disposal schedule also governs the disposal of the converted record. When converting, make sure the authenticity of the record is maintained and the record should be complete, confidentiality requirements of the record are as well considered (Williams, 2018).

Resolution (DPI/PPI)

DPI stands for Dots per inch which is a printing term. The proper term to describe images viewed on a computer screen is pixel per inch (PPI). It is used to translate an image from analogue to digital format and back. The PPI of an image is less important than its pixel dimensions in determining overall image quality. It is advisable to adjust the PPI to achieve your target pixel dimensions (Alghanim, 2018). For example, scanning a 10- inch photo on a flatbed scanner at 300 PPI will produce a 3000-pixel image, while you would have to scan a 5-inch photo at 600 PPI to attain the same 3000-pixel dimensions. It should be noted that PPI is irrelevant when using a digital camera because the size of the camera's sensor in pixel dimensions/megapixels determines how large the image will be.

Image Quality

This refers to the level of accuracy with which different imaging systems capture, process, store, compress, transmit and display the signals that form an image. A digital scan is only as good as the source documents from which it is taken therefore, the use of the highest quality illustrations is recommended because those usually have the most details and will look best when zooming in (Greenwood, 2018).

Considering the image size of the documents, the most important factor in the quality of a digital image is the number of pixels it contains because that determines what level of detail it can achieve. This is the most commonly expressed in the image's pixel dimensions (widths by heights).

Condition

The documents should be in their best condition since many documents have been lost over time due to torn pages, rust from paper clips, improper storage containers, and exposure to negative elements such as pests, water, and heat. The documents should be free from staples, paper clips, binder clips, and rubber bands before digitisation. Straighten folded edges and pages, and make photocopies of pages that are deteriorating through discoloration, folds, and tears. Consider the ability of the documents to resist chemical action over time like those stored using microfilm (microfiche). It should allow reformatting of the documents; this is the action taken to preserve Information, the process involves the use of microfilm and electrostatic photocopying. Items that are not serviceable because of damage or fragility are candidates for digitization, as are items stored on unstable media (Kondi, 2018).

The attribute of the documents

The records selected for digitisation should be clear to the participants to whom they belong, they must be legible enough (readability) and be contemporaneous (they must be noted immediately after the data is generated). They must be as original as possible, consider the accuracy of the documents (readability), and indicate the originator information (who entered the data and when) metadata. If the data are collected via electronic means, the machine /software must be identifiable and be calibrated and validated. Originals in different physical formats and with different characteristics are suitable for digitisation including bound and single-sheet paper materials, photographs, negatives, and items with colour (Lacuata, 2020).

Technical consideration

Aspects of digitisation for texts, images, audio, and other genres influence selection because information can be captured in many ways at many quality levels. The institution must determine whether it can provide digital versions of the quality users need. Considering if digital images and sound will be used, and what level of quality that entails, a temporary online document might call for quite different quality than a site serving in-depth research (Kondi, 2018).

Acceptability of the resulting digital objects

The digital objects resulting from the digitisation process must meet the requirements of the custodial division and the preservation directorate. In some cases, the technology/methodology may not exist or be too immature, to produce items or collections selected for preservation (digital reformatting to test research results), consider approaches or methodologies, and determine the feasibility of large-scale production of the digitization for certain types of collections (Greenwood, 2018).

Access Aids

Access aids of all types are candidates for digitisation, especially when the advantages of digital technology will significantly enhance access to microfilm or print collections. The criteria include; guides, indices, and databases which are created for digitised records, microform, and in some cases, print collections as appropriate (Barbosa, 2019).

Colour Reproduction

Colour reproduction is the discipline dealing with how colours are printed on paper and the methods for transforming colours from some display medium such as a computer monitor to another printed paper through colour gamut mapping. It is important to be able to specify how accurately a colour must be reproduced by having an objective metric for measuring colour differences. Calibration is vital for digitisation projects because the range of colour reproduction of different devices varies considerably. The technical parameters for scanning, impacting the tone reproduction, colour reproduction, and spatial resolution have to be set up and calibrated carefully, if this is done incorrectly it results in unacceptable images. If such production steps as colour matching present a certain level of complexity in themselves, the prospect of obtaining a consistent collection of images is greatly compounded in difficulty by the many potential junctures for losing control of how images look. Any time an image is captured, or transformed to another system, medium or device, the outcome may vary from the intended results. Scanners should be calibrated using the colour targets provided with the scanning software. Constant calibration can be achieved and maintained when high-resolution images are used and all elements can be controlled. Complete documentation of the technical specifications is required because it is necessary to approximate the original images as

closely as possible in the first place and to verify this relationship perennially, even after the digital image has been migrated several times (Scott & Ummar, 2020).

Decision-making matrix

It would be perfectly possible for the decision-making matrix to be applied to whether the resource should be digitised. This would be quite an in order, as a similar collaborative activity between departments. Digitisation should be available where proposed digitisation programs meet the agreed criteria for decision-making, selection, and image capture. The selection process must undertake a study of digital archiving as it affects research-based institutions. They are looking at CD-ROMs, websites, dynamic email discussion lists, and other sorts of using the twenty issues/questions. It is possible to arrive at a collection development policy. Rather it is a decision-making tool that informs the basic decision-making matrix to inform the selection process in a digital arena.

2.3. Objective 3: Technologies and equipment to be used during the digitization of manual medical records

All recorded information in organisations is analogue in nature. The analogue information can include printed books, periodical articles, manuscripts, cards, photographs, vinyl disks, videos, and audiotapes. However, when analogue information is fed into a computer, it is broken down into 0s and 1s changing its characteristics from analogue to digital. An endless number of identical copies can be created from a digital file because a digital file does not decay by copying. Moreover, digital information can be made accessible from remote locations simultaneously by a large number of users. Moreover, digital information can be made accessible from remote locations simultaneously by a large number of users and copies can be created from a digital file, because a digital file does not decay by copying. (Ramasamy, 2017)

Digitisation is an interlinked system of hardware, software, image database, and access sub-system with each having its components. A typical scanning workstation for a small, production-level project could consist of the following: hardware (scanners, computers, data storage, and data output peripherals), software (image capturing and image editing), network (data transmission), display and printing technologies (Ramasamy, 2017).

There are different types of digitisation hardware or technologies as follows;

Mekel Technology microfilm and microfiche scanners and software: These come in a wide range of types

- MACH-Series Microfilm Scanners: Quickly digitise 16/35 mm microfilm in excellent image quality and they are in three series models i.e., MACH5; MACH10; MACH12
 - MACH7 Microfiche scanners: This scan jacket/COM/AB Dick/Microx/Ultra fiche and standard aperture cards and it's up to 600 dpi true optical resolution.
 - IMAGE host image retrieval system: scan and host microfilm and microfiche collections in their original format and access images from any mobile or traditional device with Wi-Fi access.
- ❖ Wicks and Wilson microfilm, microfiche, and aperture card scanners and software: These come in a wide range of types and they include;
 - ❖ ODS Overhead Document Scanner: Scans A2-A3 size documents, bound books, notebooks, binders, photographs, graphic arts, and more and gives a user-friendly walk-up book copy system.
 - ❖ C400 aperture card scanners: Converts 35 mm aperture cards on-demand or at a production level and has an automatic or manual reading of Hollerith code data.
 - ❖ UScan+ HD UF-Series universal film scanner: Has industry-high 18-megapixel active pixel area array sensor and a dpi resolution of up to 2400 and comes in two models: UScan+ HD and UScan+ HD LTE.
 - ❖ Extek Microsystems microfilm duplicators: these are of two types i.e.
 - 2150 Silver Film Duplicator: Designed to meet the needs of users having low-volume microfilm duplication requirements, compact, and has a completely self-contained desktop unit. Suitable for use in an office environment and has automatic features that allow for unattended operations.
 - 3441 Silver Film Duplicator: Comes with a free-standing unit, designed to produce high-quality duplicates from old, curled, and damaged masters work with all types of master films and put the least possible stress on fragile masters, including those with nitrate or acetate backings
 - HF Processors microfilm processors e.g., the Minilab Master 200PDS. It has a 16/35mm silver (B&W) dual-strand film processor, a microprocessor temperature controller, and a digital speed readout with an adjustable output of up to 40 feet or 12.2 meters per minute.

Additional capture equipment brands used in digitisation include:

- Avison document scanners
- Digital Transitions 100MP graphic arts cameras
- InoTec document scanners
- WideTEK 36DS wide-format document scanner
- Qidenus Technologies manual, semi-automatic and robotic book scanners
- Zeutschel book, graphic arts, and, large-format scanners

Tools used for digitisation include several core and peripheral systems and include the following; (Ramasamy, 2017)

Digital scanners

- ❖ Digital scanners are used to capture digital images from analogue media such as printed pages or a microfiche/microfilm at a predefined resolution and dynamic range (bit range). There are two types of image scanners: vector scanners and raster scanners.
- ❖ The vector scanners scan an image as a complex set of x and y coordinates. Vector images are generally used in Geographical Information Systems (GIS). Images can be zoomed in proportion to display minute details of a drawing or a map. Maps, engineering drawings, and architectural blueprints are often scanned as vector images.
- ❖ Raster images are captured by raster scanners by passing lights (laser in some cases) down the page and digitally encoding it row by row. Multiple passes of lights may be required to capture basic (as a set of bits known as bitmap) colours in a coloured image. Raster scanners are used in libraries to convert printed publications into electronic forms.

How does a scanner work?

Scanners are equipped with a lamp that moves with the scanner head to light up the object being scanned. Most scanners use a cold cathode fluorescent lamp or a xenon lamp. The scan head is made up of the mirrors, lens, filter, and charge-coupled devices (CCD) array. A belt that is connected to the stepper motor makes the scan head move. A stabilizing bar prevents wobbling during the pass. The mirrors reflect what is being scanned into the lens and the image is then focused through a filter on the CCD array. Three smaller images of the original are made by the lens. These images then go through a

colour filter and onto a section of the CCD array. The data is then combined into a single image. While selecting a scanner, one should consider resolution, sharpness, and rate of image transfer. The resolution is measured in dots per inch (dpi). The average scanner has at least 300x300 dpi. The number of sensors in a row of the CCD array determines a scanner „s dpi. Sharpness depends on how bright the lamp is and the quality of the lens. Image transfer depends on the connection used to connect the scanner to the computer. The slowest is the parallel port. Universal Serial Bus or USB scanners are affordable, easy to use, and have good speed. The hardware required for a scanner is a connector such as a USB. The software required is a driver. The driver is needed to communicate with the scanner.

There are the following types of Scanners:

Flatbed Scanners – right angle, prism and overhead flatbed, Sheet-Feed Scanners, Drum Scanners, Digital Cameras, Slide Scanners, Microfilm Scanners, Video Frame Grabbers, and Hand-held scanners. The type of scanner selected for an imaging project would be influenced by the type, size, and source of documents to be scanned. Many scanners can handle only transparent material, whereas others can handle only reflective materials.

❖ **Flatbed Scanners:** Flatbed scanners are the most common and widely used scanners that look like a photocopier and are used in much the same way. Source material in a flatbed scanner is placed face down for scanning. The light source and charge-coupled devices (CCDs) move beneath the platen, while the document remains stationary as in the case of a photocopying machine. The flatbed scanner comes in various models like a right-angle, prism, and planetary/overhead to handle bound volumes and books. A flatbed scanner can usually scan a document at 600 dpi. Many flatbed scanners, however, offer higher resolution.

□ **Sheet feed Scanners:** In a sheet-feed scanner, as is indicated in the name, the document is fed over a stationary CCD and light source via roller, belt, drum, or vacuum transport. In contrast to a flat-bed scanner, the sheet-feed scanner has the optional attachment of auto-feed uniform-sized stack of documents to be scanned.

❖ **Drum Scanners:** Source material in a drum scanner is wrapped on a drum, which is then rotated past a high-intensity light source to capture the image. Drum scanners offer superior image quality, but require flexible source material of limited size that can be wrapped around the

photosensitive drum. Drum scanners are specially targeted for the graphic arts market. Drum scanners offer the highest resolution for gray scale and colour scanning. Drum Scanner uses Photo-Multiplier (Vacuum) Tubes (PMTs) instead of CCDs, which offer a greater bit depth (12 to 16 bits).

❖ **Digital Cameras:** Digital cameras mounted on a copy cradle resemble microfilming stands. The source material is placed on the stand and the camera is cranked up or down to focus the material within the field of view. Digital cameras are the most promising scanner development for library and archival applications.

❖ **Slide Scanner:** Slide scanners have a slot in the side to accommodate a 35mm slide. Inside the box, the light passes through the slide to hit a CCD array behind the slide. Slide scanners can generally scan only 35mm transparent source materials.

❖ **Microfilm Scanner:** Specially targeted to the library/archival applications, microfilm scanners have adapters to convert roll film, fiche, and aperture cards into the same model.

❖ **Video Frame Grabber or Video Digitizer:** Video digitisers are circuit boards placed inside a computer and attached to a standard video camera. Anything that is filmed by the video camera is digitized by the video digitizer.

❖ **Hand-held Scanners:** Hand-held scanners are used for scanning selective sections of data. It may require multiple passes to capture a large area. Moreover, a user should have a steady hand while moving the scanner over the document to be scanned. These scanners are normally used for circulation work in a library.

❖ **Scanning Software:** The scanning software is used for scanning the image and capturing it in the computer. This software is provided by the manufacturer of the product to the buyers. These drivers translate the instructions into commands, which the scanner understands.

❖ **Image Editing Applications:** Image editing applications are used once the process of scanning the image is over and the image is available in the computer for further manipulation. Most image editing software offer features like image editing, sharpening, filtering, cropping, colour adjustments, forms conversion, resizing, etc. Most image editing software can also be used for capturing images.

2.4 Objective 4: Challenges faced in the digitisation process of manual medical records

Digitisation has shown the emergence of innovations that turn most organisations to be more efficient and systematic. In terms of the business offering, digitisation allows the processing, storage, and transmission of data to be done at equal efficiency. In the context of records management, digitisation permits most modern organisations to share access and distribute their data without the potential risk that is lost via the conversion of analogue data to the digitally needed format. As a fact, the importance of digitisation towards the development of sound digital resources has been greatly supported by positive feedback due to the influence of advances in computer technology. The quality of the information in digital form is that by its nature, it is not fixed in the way that texts are printed on paper. Even so, digitisation is a powerful way to expand access to collections that enable their wide use for service provision, education, leisure, research, tourism, and other purposes (Manzuch, 2009).

There are challenges and implications surrounding digitisation including time, cost, cultural history concerns, and creating an equitable platform for historically marginalized voices. Many digitising institutions develop their solutions to these challenges. Some analogue materials, such as audio and video tapes, are nearing the end of their life cycle, and it is important to digitise them before equipment obsolescence and media deterioration make the data irretrievable (Jeremy, 2021).

Technological changes can happen often and quickly, so digitisation standards are difficult to keep updated. Professionals in the field can attend conferences and join organisations and working groups to keep their knowledge current and add to the conversation. (Kagoro, *et al.*, 2012) listed the challenges of digitisation and included;

1. Funding and Cost

Digitisation is expensive due to enormous funding for migrating hardware and software. Insufficient funding is one of the challenges in implementing digitisation in local cultural institutions (Zuraidah, 2007). Funding for the purchase and maintenance of modern and state of the art digital equipment remains a major constraint and they further assert that there is a need for external funds to be injected. Digitisation work towards records and archives needs additional funds to support the complete project, which includes improving the automation of hardware and software, as well as the expense of subscribing to all items in terms of electronic and databases (Azim, *et al.*, 2018).

2. Wrong File format

Rapid changes in technology mean that file formats can become obsolete quickly and cause problems for records management strategies such as patient records. The software in which a file is created usually uses a default format when the file is saved. This is indicated by the file name suffix (e.g., PDF for portable document format). The format chosen affects long-term records management abilities. The effort to reformat or re-change any object into digital, the result will be lost as explained by Routhier Perry (2014)

3. Obsolescence of Technology

Nowadays, as we know, technology is quickly changing and it is a major challenge for users (Azim, *et al*, 2018). Poor technology leads to poor-quality images or output and also can lead to damage to the record

4. Another major challenge is electricity

Computerisation and digitisation become unrealizable in an environment of epileptic power supply. For instance, most organisations suffer from acute power supply disruption from the national grid. This has resulted in a constant breakdown of the digitisation equipment hence institutions, companies, and individuals are forced to procure alternative power supply which has prohibitive initial financial outlay and running cost. The issue of power has become a national calamity; thus, it has to be given priority by any organisation aspiring to attain global visibility. This issue could also be addressed by cultivating a power-saving culture. When purchasing computers, for instance, preference has to be given to flat screen monitors because they consume less energy when compared to CRT display units.

5. Scanning pages of brittle old records at high speed without doing damage to them

This is another problem that calls for urgent attention. Furthermore, storage of the digital information in the storage media of choice as well as the preservation of the content of the storage media and the media themselves pose another major challenge. Though major achievement has been recorded in the area of procurement of equipment for digitisation, getting appropriate content management software to make the digitised information available online to users remains a major challenge.

6. Inadequate Infrastructural Facilities

The adequacy of infrastructural facilities is another important element to support the digitisation project. In this case, poor infrastructure significantly impacts the digital project as the resources to implement digitisation must be enough to digitise a large volume of records.

Inadequate infrastructural facilities make the digitisation project greatly hampered due to necessary equipment and others as well as digitisation requires a complete resource of facilities to ensure the project can be run in effectively (Akter & Begum, 2016). Digitisation of materials and indeed global visibility require the setting up of computer networks at the local, metropolitan and national levels. Information abounds on the web on digitisation and other topics of interest which must be able to access. The UNESCO site, for instance, made available the content of Bohemia 19988, a CD-ROM about the digitisation of rare materials and a very rich resource.

7. Technical Issue

The technological requirements such as types of technical equipment with a high demand of maintenance and care of handlings to ensure its continuous quality namely; picture quality, resolution, bit depth, image enhancement techniques as well as performance are other identified challenges to be considered for digitization of records (Zakaria, *et al*, 2018). In this regard, the decision of the agencies is crucial for the selection of appropriate technical equipment for their digitisation project, for instance, advanced technology scanning machines.

8. Lack of Training

The need to embrace the digitisation of learning has become a critical success because understanding the concept of digitisation is very important in project digitisation. Lack of training is one of the causes that hinder digitisation projects (Bohemia, *et al*, 2018). Moreover, poor basic digital skills in digitization can cause failure for the agencies and become lagging behind digital technologies. Thus, it is essential for leveraging training and education for employees to be more adaptable and flexible to keep up with rapid technologies (Forrest, 2017). Training/capacity-building remains a key challenge in digitisation as it requires a combination of skills (scanning, photographing, etc.) Many organisations lack basic computer training, not to mention specialised training required in the art of digitisation. There is a need for continuous training to build staff capacity in equipment maintenance and software

management. In recent times, there have been a series of ICT bodies but only a few get sponsored to attend while most could not afford to sponsor themselves. It is cheaper to train staff than to outsource. Therefore, it is important that every information professional who is involved in digitisation work to be aware of the real challenges that they may encounter during the process of digitisation (Azim, *et al.*, 2018).

9. Lack of Specialize Policy and Guidelines

A policy is a guiding statement that is essential to support the process of digitisation. As a fact, policy and guidelines serve as a working tool for the stage of planning and post records digitisation projects. Zuraidah, 2007 revealed that cultural institutions tend to agree most strongly that lack of the national standards and guidelines is the main reason the institutions are not implementing digitisation. Several policies have been developed nationally and internationally, however, those policies and guidelines are purposely created within a context of legal and ethics for the management of libraries and archives, hence, there is still a need for some modifications to the existing policy and guidelines that suit the needs of government departments (Azim, *et al.*, 2018).

2.5 Objective 5: Guidelines for digitisation of manual medical records of Entebbe regional referral hospital records

The digitisation process is an approach to explain the step-by-step arrangement of digitising information resources to accomplish the process of digitisation including its various phases, like the process of material selection, preparation of documents, scanning or OCR use of a scanner, processing for editing, quality assurance, metadata and indexing, back-up and archiving, publishing in a digital repository and finally checking out (Collence, *et al.*, 2021).

Below are some of the guidelines according to different literature;

Before the digitisation process of records and archives, there are factors that need to be known, which include organisational and technological factors.

In addition, lack of budget could prevent the successful implementation of the digitisation of records and archives programmers. Therefore, Top management should allocate a budget that plays a key role in meeting the financial demands of digitisation (Alkhofani, *et al.*, 2019).

Technical requirements and implementation, the technical standards for digitisation require sourcing records in line with best practices and technical standards. Another step involves assessing the current standing which is a way to evaluate what technology to update and to identify what digital tools to change will help in prioritising the efforts and investment in digital transformation strategy in the best possible way (Zhovtyuk, 2018).

Document preparation

The preparation of documents is key to enabling selected documents to a flawless procedure that is devoid of office objects such as document clips, sticky notes, pins, and spiral bind. Before digitising the documents, it is a must to make a document preparation process. Before digitising those documents, it is a must to make a document preparation process (Radzi, *et al.*, 2018).

File Format

This one would depend upon the volume of your records and the level of accuracy you are aiming for. You can save your records in image formats like .jpeg, .img, etc., or in PDF format or both. OCR or Optical Character Recognition software is used to digitise poorly printed and handwritten documents, but can be inaccurate at times and is suitable only for low-volume work. Professional Records Management System vendors recommend sticking to the PDF format only.

Indexing and metadata capture

Indexing is one of the most important processes in the retrieval system. It forms the main function in the Information Retrieval process as it is the first step in helping to retrieve the information accurately and efficiently. The indexing can reduce the documentation activity to the mandatory term contained therein. Mapping from information to the respective documents contained therein (Radzuan, *et al.*, 2018).

Scanning/OCR (Optical Character Recognition)

This is the conversion of physical documents to an electronic format which requires the use of highly efficient, reliable, and speedy electronic scanning machines. Optical Character Recognition is used in converting images, handwritten or printed text into machine-encoded text, whether from a scanned document, this is important because it will make the document searchable and easy to locate and retrieve them. This digitalisation process can be stored as a file on the computer for reuse. In addition,

the most commonly used scanners are scanners that store objects on glass windows. This scanner has a variety of types available for example flatbed scanners, sheet-fed scanners, integrated scanners, drum scanners, and portable scanners (Azim,*et al*, 2018).

Quality control

This is vital to ensure quality control so that the output will be acceptable to the general public and meet international standards. Records should be secured to enable the integrity of the information, and data encrypted and securely kept to guard against loss of information (Taube, 2017).

Storage

Digital content must be preserved for further use (Azim,*et al*, 2018). There is a plethora of storage media to securely contain your digitised records. From flash drives, DVDs, external hard drives, video libraries, etc. to cloud storage and internal servers, multiple options are there at your disposal. However, your best investment would be an Electronic Document Management System or EDMS.

Security

We found that a vast majority of health records were compromised due to poor human security (Liu, *et al*, 2022).

2.6 Research Gap

In the view of the above, there has been a lot of research about records digitisation. However, there is no specific research that has been conducted in special reference to the development of a guidelines user manual for the digitisation of medical records at ERRH. That is why the group has conducted the study leading to the development of a guidelines manual for the digitisation of medical records at ERRH

CHAPTER THREE: METHODOLOGY

3.1 Introduction

Katebire, (2007) defines methodology as the technical and scientific activities, tools, and procedures used to plan, gather and analyse data. This section presented the methods the researchers used in the study. This involves the Area of the study, Research Design, Study population, Sampling techniques, sample size, Data collection methods, Research Instruments, Data analysis and presentation, Data analysis, Data presentation, Data quality control, Data Validity, Data Reliability, Research procedure, Ethical considerations, limitations of the study and time frame and Conclusion.

3.2 Area of study

The research was carried out at Entebbe Regional Referral Hospital. It is a public hospital funded by the Uganda Ministry of Health. The hospital is located in the central business district of the town of Entebbe, in Wakiso District, approximately 44 kilometres (27 miles), by road, southwest of Mulago National Referral Hospital, the largest hospital in the country, located in Kampala, Uganda's capital and largest city. The hospital featured prominently during the two COVID-19 pandemic waves in Uganda, one in 2020 and another in 2021.

3.3 Research Design

A research design also called a research strategy is a plan to answer a set of questions (McCombes, 2020). It is a framework that includes the methods and procedures to collect, analyze, and interpret data. In other words, the research design presented how the researcher will investigate the central problem of the research, and thus it was part of the research proposal. Research designs are plans and procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis (Creswell, 2013).

The research was based on a case study research design carried out at Entebbe Regional Referral Hospital. Creswell, (2013) defines a case study as a qualitative strategy in which the researcher explores in depth a program, event, activity, process, or one or more individuals. The researchers, therefore, used cases that are bounded by time and activity, and researchers collected detailed information using a variety of data collection procedures over a sustained period.

The researchers used a mixed approach of qualitative and quantitative research. Thus, it is more than simply collecting and analysing both kinds of data; it also involved the use of both approaches in tandem so that the overall strength of a study is greater than either qualitative or quantitative research (Creswell, 2007).

3.4 Study population

Shukla (2020) defines population as the set or group of all the units on which the findings of the research are to be applied. The study mainly concentrated on the Medical Records staff of Entebbe Regional Referral Hospital. This includes medical records officer, medical records assistants, data Entrants, and ward in-charges. This is because they are the ones who are responsible for the management of the records from the time of creation to their ultimate disposal.

3.5 Sampling

Sharma (2017) defines sampling as a technique (procedure or device) employed by a researcher to systematically select a relatively smaller number of representative items or individuals (a subset) from a pre-defined population (sample frame) to serve as subjects (data source) for observation or experimentation as per objectives of the study.

The main primary goal of sampling is to create a representative, one in which the smaller group (sample) accurately represents the characteristic of the big group (population). Sampling is closely related to the generalisation of the findings.

3.5.1 Sampling techniques

The respondents were selected using purposive sampling. Purposive sampling was used to detect issues within a wide range of situations. It provides the richness and depth of the case description. The researcher sought to use a purposive sampling technique because it was the best way to find respondents knowledgeable about the digitisation of manual medical records to participate in the study.

Purposive sampling also known as Judgment sampling is the process whereby a researcher selects the samples based on experience or knowledge of the group to be sampled.

3.5.2 Sample size

According to Institute for Work and Health, sample size refers to the number of participants or observations that a researcher includes in a study and tends to interact with participants when collecting data. This number is usually represented by the letter n. The sample size of the study was determined regarding the researcher's interest and it constituted staff based on organisation structure, especially the medical records department. The staffs who were involved in the study included medical records staff, Data entrants, and ward in-charges.

Table 1: A table showing the sample size

Category of respondents	Targeted population	Sample size	Sampling technique
Medical records officer	1	1	Purposive sampling
Medical records assistant	2	1	Purposive sampling
Ward in-charges	5	3	Purposive sampling
Data entrant	2	1	Purposive sampling
Total	10	6	

Source: Primary data 2022

3.6 Data collection methods

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes (Roux, 2022). Observation and interview were used in the study as elaborated in the context below.

3.6.1 Interview method

Interview as a data collection method was used. An interview is a qualitative research method that relies on asking questions to collect data which is a face-to-face conversation between the researcher(s) and a respondent(s) conducted to obtain information. Interviews involve two or more people, one of whom is the interviewer asking questions to get answers from respondents involved in the study (George, 2022).

3.6.2 Observation method

Observation is a way of gathering data by watching behaviour, and events, or noting the physical characteristics of participants in their natural setting. Observation can be overt or covert, direct or indirect (CDC, 2018).

The researcher(s) used the observation method to physically see the types of manual medical records being digitised and the criteria to be used in the selection of medical records for digitisation, technologies, and equipment to be used by Entebbe Regional Referral Hospital especially medical records department for digitising manual medical records, challenges faced in medical records management for manual medical records and the guidelines.

3.7 Research instruments

Research instrument refers to any tool that the researcher may use to collect or obtain data, measure data and analyze data from the respondents that is relevant to the subject of the study. In this study, several research instruments were used such as an interview guide and observation guide as explained below (Discover PhDs, 2020).

3.7.1 Interview guide

The interview guide is a logical sequence of topics and questions that help the researcher conduct an interview session. The guide was organised into sections according to the different areas that needed to be explored during the research; each section came with a detailed set of questions that helped the researcher(s) to cover the topic in the study. An interview guide was used which consisted of open-ended questions that solicit in-depth responses about the respondents' experiences, perceptions,

opinions, and knowledge relevant to this study. The guide helps the researcher remember all the key aspects to explore.

3.7.2 Observation Guide

This instrument contained several aspects of the study that the researcher(s) took into consideration while observing the phenomenon during data collection. The observation guide was useful, especially on activities that cannot be measured. The observation guide helped the researcher(s) to analyze the steps or procedures followed in the digitisation process throughout the digitisation lifecycle.

3.8 Data analysis and presentation

This section discussed the approaches that were followed when analysing the documents and interview data. The purpose of data analysis was to reduce sets of data as a basis for data management. In this case, both non-qualifying and quantifying techniques of analysis were used to present the research findings.

3.8.1 Data analysis

Data analysis is defined as a process of cleaning, transforming, and modelling data to discover useful information for business decision-making. The purpose of Data Analysis is to extract useful information from data and take a decision based on the data analysis (Johnson, 2022).

In this study, both qualitative and quantitative approaches of data analysis were used to analyse data and extract meaningful information which enabled the researcher(s) to make sense of it, correct mistakes, organize, provide structure and elicit meaning.

3.8.2 Data presentation

Data was presented in figures and narratives for statistical analysis. In qualitative research, information obtained from participants is not expressed in numerical form.

Presenting data involved the use of a variety of different graphical techniques to visually show the reader the relationship between different data sets, to emphasize the nature of a particular aspect of the data, or to geographically place data appropriately on a map (Searl, 2017). A manual for Guidelines

for the Digitization of Manual Medical Records at Entebbe Regional Referral Hospital was developed and attached.

3.9 Data quality control

Data quality control ensured that the data collected is accurate and trustworthy. According to the open university, Quality control of data is an integral part of all research and takes place at various stages for example during data collection, data entry or digitisation, and data checking. Data quality control consisted of data validity and data reliability which are concepts used to evaluate the value of research.

3.9.1 Data Validity

Validity refers to how accurately a method measures what it is intended to measure. If research has high validity, which means it produces results that correspond to real properties, characteristics, and variations in the physical or social world (Middleton, 2019).

The research team was mainly concerned with content validity concerning whether or not the collected data reflects the guidelines for the digitisation of manual medical records at Entebbe Regional Referral Hospital. This was achieved by checking and correcting mistakes in the findings of the team with the help of the supervisor. In this case, the content was made responsive, comprehensive, and consistent with the variables and the sample of subjects measured.

3.9.2 Data Reliability

Reliability refers to how consistently a method measures something. If the same result can be consistently achieved by using the same methods under the same circumstances, the measurement is considered reliable. Based on this concept, the research team used two data collection tools i.e., an interview guide, and an observation guide, all results were analysed to ensure the consistency of data. Reliability was tested by checking the consistency of results across time, across different observers, and across parts of the test itself. Although unreliability is always present to a certain extent, there will generally be a good deal of consistency in the results of a quality instrument gathered at different times (Middleton, 2019).

3.9.3 Research Procedures

This refers to the steps that researchers follow when carrying out research. The researchers first submitted their topic to the research project coordinator who then approved the topic research. Thereafter, the researchers wrote a proposal with the help of the supervisor who guided them on what to include in the research. This was to ensure the proposal enables the researchers to achieve the overall goal of the project. After approval of the research proposal, a letter was issued to the researchers by the Head of the Records and Archives Department at East African School of Library and Information Sciences, Makerere University which introduced the researchers to the hospital. This was after the pre-test of the data collection instrument with the guidance of the supervisor. Thereafter, the research team compiled data and wrote a project report of findings with the help of the supervisor, and later the researchers submitted the research report for evaluation.

3.9.4 Ethical Considerations

Permission to carry out the study was obtained from the East African School of Library and Information Science, especially at the stage of data collection where the research team had to first obtain a letter from relevant authorities. The research team ensured that there are informed consent where-by respondents were informed about the details of the study and consequently the team assessed their willingness to participate. In addition, this enabled the team to observe a high level of confidentiality and privacy when handling the data collected from respondents.

3.9.5 Limitations of the study

The constraints we anticipated meeting include the following;

The stipulated time for study was very limited, so enough time has to be allocated to us to research and come up with well-standing projects that can benefit both the study organisation and the university as well as change the student's career by earning income if these projects are adopted and implemented by the target organisations.

Response bias: Individual characteristics of participants influenced their responses to questions; therefore, the research team anticipates biased responses, over-responsiveness, and acceptance.

Researcher's bias: The researchers took the lead in the participants' natural environment, this created bias in case of a negative response from the respondents. There was a financial challenge as the research team had various financial obligations to the institute.

3.9.6 Delimitation of the study

The following are the solutions to the anticipated constraints;

The research team tried their level best to execute all the research project work in the stipulated time i.e., presenting the research proposal on time to the supervisor and processing an introductory letter to the study organization which commenced the study.

The participants were informed prior by the research team, who explained the purpose of the interview, confirmation of confidentiality and a signed consent form was helpful in mitigation of response bias.

The research team developed a habit of picking up a bracket, listening, and looking at things critically to overcome the challenge of researcher biases. Proper budgeting of the available finance enabled the researchers to overcome the financial challenge.

Conclusion

In conclusion, this chapter outlined the procedure for the performance of the study, discussed the steps and activities performed during the study, researchers identified and discussed the research design approach, population of the study, sample size and sampling technique, data collection methods, data collection instruments, data analysis techniques, data quality control, and the ethical considerations of the study as presented above.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS, AND DISCUSSIONS OF FINDINGS

4.0 Introduction

This chapter presents the data gathered, the results of the statistical analysis done, and the interpretation of the findings. These are presented in tables and other graphical representations following the sequence of the specific research topic which is developing guidelines for the digitisation of manual medical records in Entebbe regional referral hospital. The findings are based on the respondents' opinions, views, and judgments in line with the study objectives. In collecting and analysing data the researcher used two different methods of data collection that is to say interviews, questionnaires, and observation. The study was based on both a quantitative and qualitative approach.

4.1 Response rate and participant profile

In collecting data, an interview guide, and an observation guide were used to collect the presented data as the main tools as informal interviews were used. This section is aimed at examining the number of respondents from the different categories of people who participated in the study.

Table 2: A table showing the Response rate

Category of respondents	Targeted Number of respondents	Actual Number of respondents	Response rate (%)
Medical records officer	1	1	16.67
Medical records assistants	2	1	16.67
Ward in-charges	5	3	50
Data entrants	2	1	16.67
Totals	10	6	100

Table 2 above shows the number of respondents who participated in the interview. The biggest number of respondents who participated in the interview was the ward in-charges with a percentage of

50 and this is because they manage records while they are still active in the respective wards such as the children’s ward, medical ward, maternity, gynaecology, and casualty. The smallest numbers of respondents with a percentage of 16.67 are the medical records officer, medical records assistant, and data entrants.

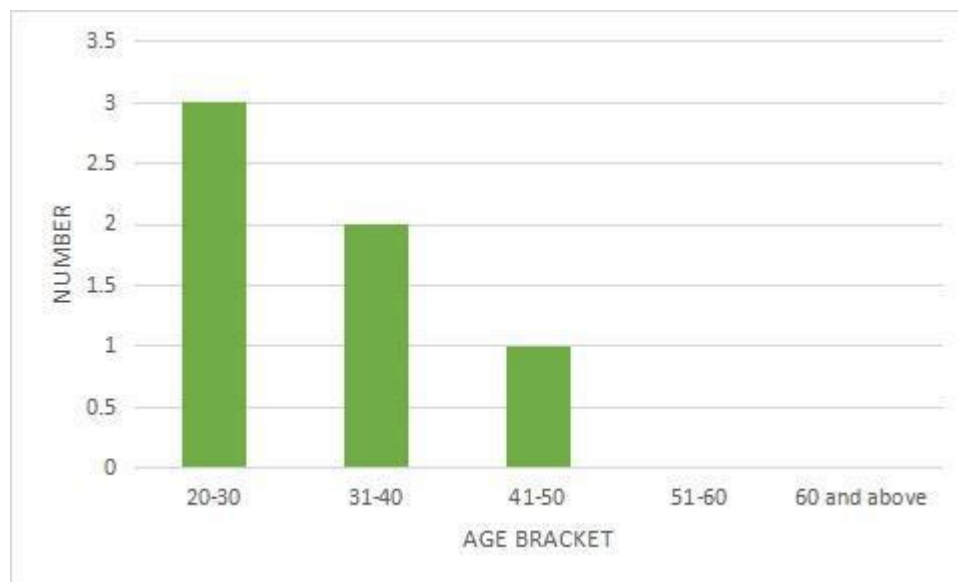
4.2 Characteristics of the respondents

This section explains the gender, sex, age, and level of education distribution of the respondents in the study. This information helped the researchers to identify whether the respondents are balanced in their categories. This was to make sure that the study population was representative of the whole population.

4.2.1 Age distribution of the respondents

Age refers to the number of years a person lives right from the time of birth and is usually measured in years. Age was grouped into five groups that is to say 20-30, 31-40, 41-50, 51-60, and 61 above. According to the analysis carried out, it was discovered that 3 respondents are in the age group of 20-30 years and this is the highest number of respondents. This is followed by 2 respondents in the age bracket of 31-40 and 1 respondent was the age bracket of 51-60

Figure 1: A graph showing the age distribution of respondents

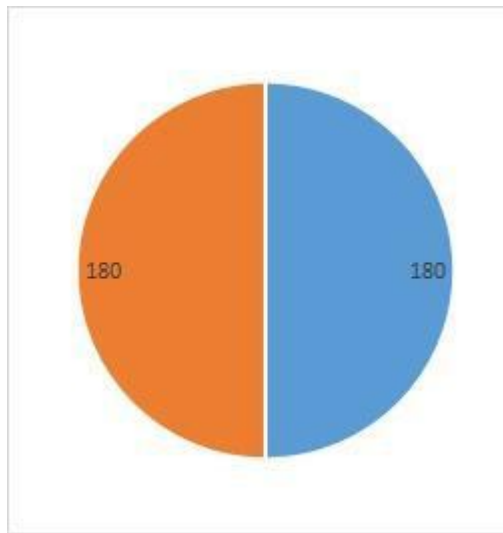


Source: primary data

4.2.2 Gender of the respondents

According to the findings of the study, it was discovered that 3 were females (180degrees), and 3 were males (180 degrees). This shows a fair proportional representation of both genders because these were the only male and female workers around in the departments. Gender was examined in the study to eliminate biases during the study. The relatively balanced gender representation reduced on biased in the data collected and suggestions from the study population.

Figure 2: A pie-chart showing the gender representation of the respondents



■ FEMALE ■ MALES

4.4.3 Professional level of the respondents

The study also examined the educational level of the respondents who participated in the study. The results are shown in the table. The professional level of education of the respondents refers to the required professional knowledge that the respondents have to qualify them in their provision of service to the hospital. 50% had masters, 16.67% had bachelor, 16.67% had Diploma and 16.67% had certificates. This shows an average number in the response according to educational level.

Table 3: A table showing the education level of the respondents

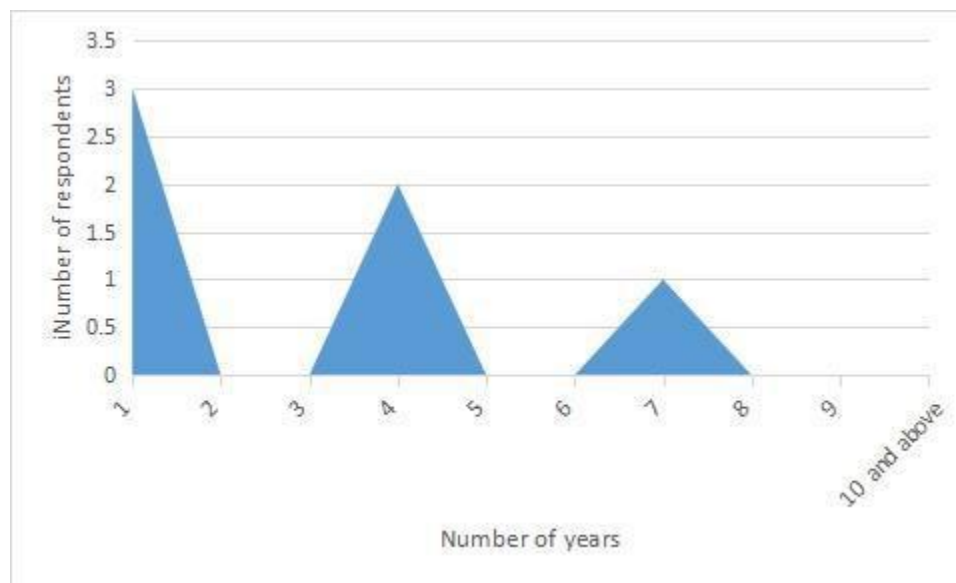
Level of education	Number	Percentage (%)
Masters	3	50
Bachelors	1	16.67
Diploma	1	16.67
certificate	1	16.67

Source: Primary data 2022

4.2.3 Work experience of the respondents

The study also examined the work experience of the respondents, that is to say, the number of years they had spent in the hospital. This was to help the researcher know the level of knowledge that the respondents had regards to records management. It was noted that 3 respondents had spent 2 years in the hospital, 2 respondents had spent 4 years and 1 respondent had spent 7 years. The number of years spent in the hospital is as presented below;

Figure 3: A graph showing the duration of the respondents at the workplace

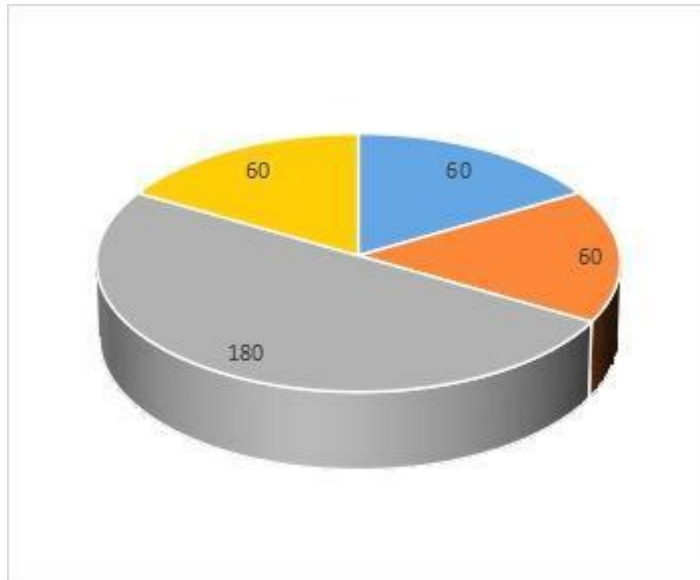


Source: primary data 2022

4.2.4 Working position of the respondents

The chart below shows the positions of the respondents, that is to say, 3 in-charges. These are responsible for the management of the different wards in the hospital including records in those wards. The medical records officer is in-charge of all the records in the medical records department and is assisted by 1 laboratory assistants. There is also one data entrant.

Figure 4: A pie-chart showing the positions of respondents in percentages (%)



KEY

Medical records officer
Medical records assistant
Ward in-charges
Data entrants

4.4.1 Objective 1. Types of Records kept in Makerere University Hospital

Most of the data concerning types of records generated, received, and kept at the hospital were collected through an interview method. The researcher asked respondents the question “What are the types of records created, received, and kept at ERRH?” and the responses were;

Outpatient records: The research findings indicated that the hospital creates and keeps patient records which are records of patients' daily attendance. The MRO responded that;

“Outpatient records are some of the most created records in the hospital, especially in the outpatient department and the report about the patient's attendance who were attended to, treated, and also review cases are collected every week by the medical records staff and this is done every Monday.”

Such records include registers, lab tests, and results, diagnosis, prescription, patients' history, weekly, monthly and quarterly reports as discussed below;

Registers: this is where the patient's history, diagnosis, and prescription are entered by one of the staff at the receiving desk of OPD specifying the type of metadata captured. The information captured includes the name of the facility, month, financial year, serial number, NIN, name, age, sex, residence, next of kin and contact, diagnosis and treatment are given.

Medical records assistant (MRA) respondent revealed that;

“Out-patient registers are used in collecting information on the utilization of health services at the hospital, for planning activities of the out-patient department, it shows the drugs needs at the OPD, it exposes the disease pattern at the hospital and also aids follow-up of the patients attending for great for care at the hospital.”

Reports: Research findings indicated that reports were part of the records kept in the medical records department of the Hospital. These are records collected by the medical records officer on a weekly, monthly, and quarterly basis specifying the number of patients attended to base on differential diagnosis and later entered into the system by data entrants.

The MRO Responded that;

“Medical reports are medical records that contain systematic documentation of an individual patient's important clinical data and medical history over time. Accurate and complete weekly, monthly and quarterly reports help the

administrators to assess the performance of different departments, get to know the patients turn up based on diagnosis, and to know the prone disease that needs serious attention.”

Inpatient records: The research findings indicated that inpatient records were part of the records kept in different ward departments by the in-charge ward when they are still active and transferred to the medical records department when they become inactive only after the patient's discharge. These records deal with the patient's clinical reports, referral notes, and the patient's progress in medication.

An in charge (ward) commented that;

“The inpatient department mostly creates these inpatient records that help in providing continuity of care to the patients and act as evidence. Other inpatient departments like medical, maternity, pediatrics, and genealogy also create inpatient records in that every ward department needs medical records to fully trace the patient's progress.”

These inpatient records included; referral notes/forms, laboratory records, doctors' reports, clinical patients' records, discharge forms, and patient prescription records. These records provide evidence about the patient's health and care in the hospital; they are kept in individual patients' files and also recorded in the registers.

Patients' files

The research findings indicated that the inpatient departments generate and keep inpatient files that combine all the information or documents about the patient's health care while at the hospital.

An in-charge (Ward) responded that;

“Patients' files are part of the medical records generated, received, and kept in the hospital which combines all the different individual patient records in one file, the file contains the name of the department, patients name, and reference number. All the medical records about the patient are always filed in the patient's file.”

Discharge forms

The research findings through interviews indicated that discharge forms are records issued to patients who have recovered from sickness or disease and are ready to leave the hospital before discharging the patient from the hospital; certain information must be filed and recorded in the discharge register.

An in-charge (Ward) responded that;

“The discharge form is given to the patient who has recovered from illness and is being discharged like sent back home. The information captured includes the reason for hospitalization, significant findings, procedures, and treatments provided for patient discharge condition, patient and family instructions, and the attending physician’s signature. This helps in cases of recovery and reduces chances of readmission.”

Personnel records

The study through interviews revealed that the medical records department, especially the staff registry at the administration block manages personnel records that are created from various departments of the hospital, however, some are received from various institutions as a result of transferring an employee from one government organization to another.

The medical records assistant responded that;

“These Personnel records we keep in this registry contain personal information mainly about individual staff like; job description, appraisal forms, application letters, transfer forms, appointment letters, bio-data, leave permits, salary scale, and ranks. These records are referred to as confidential records.”

Administrative records

The research findings indicated that the hospital keeps administrative records which are records of evidential and legal value.

The MRO Responded that;

“Administrative records are some of the most created records in the medical records department, especially Registry.”

Such records include contracts, equipment and supplies, Routine activity reports, work assignment, appointment letters, meeting minutes, policies, rules, and regulations. As discussed below;

Appointment letters: these are records issued by the employer to an employee specifying the terms and conditions of the job given.

The MRO responded that;

“Job appointment letters are used to inform a candidate that he or she has been selected for a position in the hospital. It is also a welcome and overview letter. This letter boosts the confidence of the new employee and sets the tone for a positive working relationship.”

Contracts: Research findings indicated that contracts were part of the records stored in the Hospital registry. These are records issued by the organization to an employee specifying the terms and conditions of the job given and the period it will take, this can be renewable or not.

The medical records assistant responded that

“A contract is a voluntary arrangement between two or more parties that is enforceable by law as a binding legal agreement, Contract law concerns the rights and duties that arise from the agreement and these include contracts with organisations sponsoring the Hospital activities or those that the Hospital is sponsoring or procurement companies.”

4.4.2 Records formats created and received in the medical records department

The researcher asked the respondents a question “What records formats do you keep in the registry?” and the responses were as follows;

Paper Based Records

According to the interviews that were conducted, respondents explained that paper-based records are the commonest types of records created and received.

The medical records assistant commented that;

“Most of the records we keep here are in paper-based formats as you can see those patients” records are being entered in the registers by medical”.

The researcher proved this through observation. Paper records were kept in larger volumes than electronic records because medical records collected and also transferred to the medical records department were mainly in paper formats.

Electronic records

The research findings accordingly indicated that electronic records are stored in the medical records department however these were few in number.

The data entrant responded that;

“These records in electronic formats are generated by the staff and received scanning for only COVID-19 records and emails. “

The researcher observed only 3 computers in the medical records department and data entry room implying there were a few electronic records managed in the medical records department.

4.4.3 Objective 2. Criteria to be used for the selection of records for digitisation

This objective sought to find out the criteria to be used in selecting records to be digitised. It was identified in the following way;

Durability: This is done with the expectation that the originals can be accessed over time (long-term archiving).

The MRO responded that;

"We shall select only records with enduring values and those that need to be archived permanently."

Records that are temporarily stored are not digitised because such records have to be destroyed after meeting the retention periods set in by the organisation. The ongoing use of the record is based on the evidential, legal, administrative, financial, informational, and historical values that justify the permanent retention of records.

Colour reproduction: The technical specifications are required because it is necessary to approximately maintain the original images even after the digital image has been migrated several times.

A data entrant responded that; *"We shall use high-resolution images and the elements are controlled to produce good colour reproduction."*

When the colour of the image is not maintained, it might be hard to read the content thus, making it an incomplete record for use by the organisation.

Access Aids: The criteria include guides, indices, and databases created for digitised records of the organisation.

The MRO responded that: *"The records officers shall develop checklists for all the digitised records with appropriate metadata to ease retrieval of the stored records."*

A copy of the checklist is then printed and kept in a file to avoid it from being lost or softcopies damaged by viruses, it acts as a backup copy in case of any damage to the original.

Standards:

The software selected should be readily available in the local market/online pages without any restrictions or conditions of purchase, it should not be too costly as well.

The Data entrant responded that: *"We shall use the recommended national standards and requirements for archiving such as hardware, software, and specific preservation tools."*

Some of the commonly used standards include ISO 30301: Management Systems for records requirements. AMS is a management system used to direct and control how records are managed within an organization at a strategic level, Dublin core standards, to mention but a few. The Standards outline guiding principles and organizational requirements for effective records management and set specifications for electronic record keeping.

Handling and use: Records should be digitized and properly managed to aid the easy use of the record. Improper use brings damage and difficulty in retrieval.

The MRO responded that: *"We shall index, organize, and provide access to records to users."*

In terms of usage, the selected records are those which support the organisation's current prioritized activities or programs such as outreach activities in the hospital, training, and administrative programs.

Content: The content considered for records to be digitised was measured in terms of value regarding the specific records.

The MRA revealed that; *"We shall consider the content of records based on the value to the users of records and record that is mostly or frequently used."*

Intellectual value is the basic requirement in all kinds of record selection as well as determining the costs of the digitisation process. The ones which are affordable to the organisation are of preference. The costs of the digitisation process are considered in terms of the material and equipment used.

Condition: This refers to the records that were not faded, pages not missing, not torn, and all in all those records that are complete and authentic in nature.

The MRA responded that: *"We shall digitize only records in good condition so that it remains complete for users, thus, serving its purpose of use."*

The record is checked thoroughly for the above-listed conditions before digitisation is carried out, any record which seems to be incomplete is not digitised because it wouldn't have met the condition for digitisation set in by the organisation.

4.4.4 Objective 3. Examining the technologies and equipment to be used during the digitisation of manual medical records at ERRH

The researchers interviewed respondents asking what technologies and equipment are to be used during the digitisation of manual medical records at ERRH.

The MRO said; „ *“The digitisation process of manual medical records at ERRH has not started as yet but if the process is to start, some technologies and requirements should be first put in place. For example hardware (Scanners, computers, data storage, and data output peripherals), software (image capturing and image editing), networks (data transmission), and display and printing technologies.”*“

He further stated that the type of scanner selected would be influenced by the type, size, and source of documents to be scanned since some scanners can handle only transparent material, whereas others can handle only reflective materials. He said the following are the different types of scanners that should be first put in place;

Digital scanners: these are used to capture digital images from analogue media such as printed pages or a microfiche/microfilm at a predefined resolution and dynamic range. There are two types of image scanners: vector scanners and raster scanners.

Flatbed scanners: Flatbed scanners are the most common and widely used scanners that look like a photocopier and are used in much the same way. Source material in a flatbed scanner is placed face down for scanning. The light source and charge-coupled devices (CCDs) move beneath the platen, while the document remains stationary as in the case of a photocopying machine.

Sheet feed Scanners: In a sheet-feed scanner, as is indicated in the name, the document is fed over a stationary CCD and light source via roller, belt, drum, or vacuum transport. In contrast to a flat-bed scanner, a sheet-feed scanner has the optional attachment of auto-feed uniform-sized stack of documents to be scanned.”“ The researchers observed that when the digitisation process is to start, the computers currently being used in the records section can be used as equipment when digitising

manual medical records at ERRH. Computers can be important once the digitisation process has started at ERRH and can be used in accessioning, indexing, capturing metadata, and storage of manual medical records.

4.4.5 Objective 4. Examining the challenges faced in the digitisation process of manual medical records at ERRH

The researchers interviewed the respondents on the challenges faced in the digitization process of manual medical records at ERRH and these were the responses:

One of the Medical Records Assistants (MRA) responded;

„We may not have the digitisation process of manual medical records at ERRH operating now but I anticipate the following challenges once it is active.“ „Funding and Cost would be a challenge since digitisation is expensive due to large funding for migrating hardware and software. Insufficient funding is a challenge in implementing digitisation as it requires sophisticated technology and trained manpower that require an additional budget to train, manage and support the entire digitization process.“

She went ahead and made an addition:

„Wrong File format is likely to be a challenge as rapid changes in technology mean that file formats can become obsolete quickly and cause problems for records management strategies such as patient records. The software in which a file is created usually uses a default format when the file is saved and is normally indicated by the file name suffix for example; PDF for portable document format. This means that the format chosen affects long-term records management abilities and in cases of reformatting or re-changing, any object digital may cause the loss of the original record(s).“

The researchers observed that unstable electricity would be another major challenge once the digitisation process is activated. Digitisation becomes inefficient in an environment of unstable power supply. For instance, most organisations suffer from acute power supply disruption and this results in a constant breakdown of the digitisation equipment thus slowing down the work and making it tiresome.

In an interview, we had with the Medical Records Officers (MRO), one of them revealed that:

„ Scanning pages of brittle old records at high speed without doing damage to them is likely to be a challenge during the digitisation process. Furthermore, storage of the digital information into storage media of choice as well as the preservation of the content of the storage media and the media themselves pose another major challenge. ”

One of the respondents revealed that:

”Lack of training is one of the causes that hinder the digitisation projects, especially poor basic digital skills that fail the institutions by keeping them lagging in terms of digital technologies. Some of the staff are not well conversant with basic computer skills, use of other equipment to be used during the digitisation process as well as their maintenance because they have not received sufficient training about digitisation and this would be a challenge on the handling of the records. ”

One of the Medical Records Assistants (MRA) suggested that the lack of specialized policy and guidelines is anticipated as a challenge to be faced during digitization. He said:

„Lack of national standards and guidelines on digitisation is the main reason institutions are not implementing digitisation. As a fact, policy and guidelines serve as a working tool for the stage of planning and supporting the process of digitization. Several policies have been developed nationally however there is still a need for some modifications on the existing policy and guidelines that suit the needs of government departments. ” According to interviews with one of the respondents, he anticipates that limited skills possessed by the records staff are likely to be a challenge once the digitization process is activated. He revealed that *„„Some staff members have fewer skills in the digitisation process if it is to be put in place at ERRH. „ ”*

This was further observed by the low morale of employees in handling manual medical records with high levels of backlogs in office spaces, in addition to this, the research team observed that some records staff lacked a bachelors in records and Archives management i.e., they had degrees in other courses other than information management.

4.4.6 Recommendations suggested to the above challenges anticipated to be faced during the process of digitisation of manual medical records at ERRH

The provision of adequate funding was considered to solve the challenge of funding and costs. ERRH as an institution should allocate enough money to the records department. Funds too should be sought from the government to support the budgets, training, and purchase of equipment necessary to make the digitisation process. Adequate budgetary provisions are vital in ensuring that proper funding is available to support the digitization process. Funds are the driving force that ensures the success of the digitisation project.

With the issue of unstable electricity, the researchers suggested that this issue could be addressed by cultivating a power-saving culture. When purchasing computers, for instance, preference has to be given to flat screen monitors because they consume less energy when compared to CRT display units. A standby generator should be purchased and put in place to also cut down this unstable power supply and this saves time and loss of records and information even when the power goes off.

Respondents asserted that continuous training of the records staff members should be considered for the digitisation section to be put in place. Of course, a team of skilled staff members represents an effective digitisation program. Development of training programs focused on improving the digitisation of manual medical records should be considered beneficial to all the department staff since a need for continuous training to build staff capacity in equipment maintenance and software management is important. Thus, it is essential for leveraging training and education for employees to be more adaptable and flexible to keep up with rapid technologies.

Recruitment of qualified Records Staff where the institution needs to recruit people that are qualified in the records department i.e., those that have studied courses in records management for example Records and Archives management or Library and information science as they will be in a position to execute all the activities involved in the digitization section as they have to be done. These people will also be able to handle the rising number of medical records in the department. They should also be equipped with the necessary equipment that can help them reduce the backlog of records.

4.4.7 Objective 5. To develop guidelines to be used for the digitisation of manual medical records

Through the use of informal questions, the researcher inquired about what guidelines the respondents would suggest in the digitisation process and the response was as follows;

Personal source record

The medical records officer responded that; „*Document preparation is a major component of every digitisation project. The digitisation team shall need to assess the condition of the source personnel records to determine whether they can withstand the physical handling involved in digitisation, for example, the special handling of fragile or damaged records.*”

The medical records officer also added that; „*Removing papers from bindings such as staples, file clips, or paper clips, managing loose items in ways that ensure the original order of the personnel records is maintained, aligning pages to enable automatic feeding into high-speed scanners, dealing with adhesive notes, white out, blank pages, faded, torn or illegible.*”

Handling other formats

From the observations made, it was discovered that not everything in an analogue form was suited to be digitised using standard document-style procedures. For example, there were enclosures on files containing objects such as x-ray records, ward registers, audio, and videos. This meant that the digitisation team needed rules for dealing with these for example; if a sequence of paper files contains material known to require different handling, a separate process might be needed. For example, x-rays in medical files will need a different process from paper documents.

Equipment for digitisation

The MRO noted „*There was a need to buy more digitisation equipment such as scanners, and more computers.* „This was got from the interview guide.

Partially digitising patient records

The hospital administrator noted that; „*with the current effects of COVID-19, we may partially digitize patient records. Partial digitisation options might include: Chronological digitising from a certain date, digitising only certain formats such as all bound registers, and digitising only key documents.*”

Technical Specifications

The data entrant noted that; „*The technical specifications that apply to the digitisation process will depend on whether the digitised patient records are to replace the source patient records as the record of business, and whether the digitised personnel records need to be retained long-term. Issues to consider are file formats, resolution, type of image colour resolution or bit depth, and colour management.*”

Security during and after digitisation

One of the respondents reported that; „*There are no security cameras in the records departments and so there was a need for security improvement.*” This was observed in some records departments whereby there were no security measures undertaken and hence it was an issue of concern to be considered by putting in place security.

Storage of record and backup

The data entrant suggested „*the use of computers to store digitised data on the cloud.*” One of the records assistants also added that a system can be created where this data can be stored. This was through the interview guide.

CHAPTER FIVE: GUIDELINES FOR THE DIGITISATION OF MANUAL MEDICAL RECORDS AT ENTEBBE REGIONAL REFERRAL HOSPITAL

5.0 Introduction

This chapter presents the proposed User guidelines manual for the digitisation of manual medical records at Entebbe Regional Referral Hospital.

5.1 Study of the Existing Guidelines

The study examined the existing guidelines followed when digitising manual medical records at ERRH as per objective 5, and found out that the hospital lacks a manual to guide the digitisation process and this is the reason digitisation of manual medical records has not started there yet.

5.2 Weaknesses in the existing Procedures

Based on the findings, the research team realized that ERRH does not have any existing guidelines followed in the digitisation of manual medical records and therefore did not conclude with any weaknesses of existing guidelines.

5.3 Strengths of the Proposed Guidelines

The study analysed the lack of existing guidelines followed in the digitisation of manual medical records of ERRH and proposed the design of a manual with different specifications that will help in overcoming the whole challenge of digitising manual medical records. The proposed manual will have the following strengths: indicate the flow of the digitisation process, how it starts and how it ends. The strengths of the proposed guidelines are the following; to contain guidelines to be followed in the digitisation process of manual medical records at ERRH, be the first and current version for digitising manual medical records at ERRH and to contain documentation of before and after full digitisation. i.e., this will be achieved by creating an online register showing the records that have been placed for digitisation as well as an index showing fully digitised records with their metadata.

ENTEBBE REGIONAL REFERRAL HOSPITAL

MEDICAL RECORDS DEPARTMENT

MEDICAL RECORDS DIGITISATION GUIDELINES MANUAL.

DATE: 11/10/2022

5.4 INSTRUCTION: THIS IS A NEW DIGITISATION

MANUAL Purpose

This manual provides the medical records department with guidelines for digitising manual medical records. The proper digitisation guideline manual for medical records will ensure that medical records resources are utilized efficiently and effectively and that the department remains in compliance with Institutional regulations in digitising medical records.

Scope

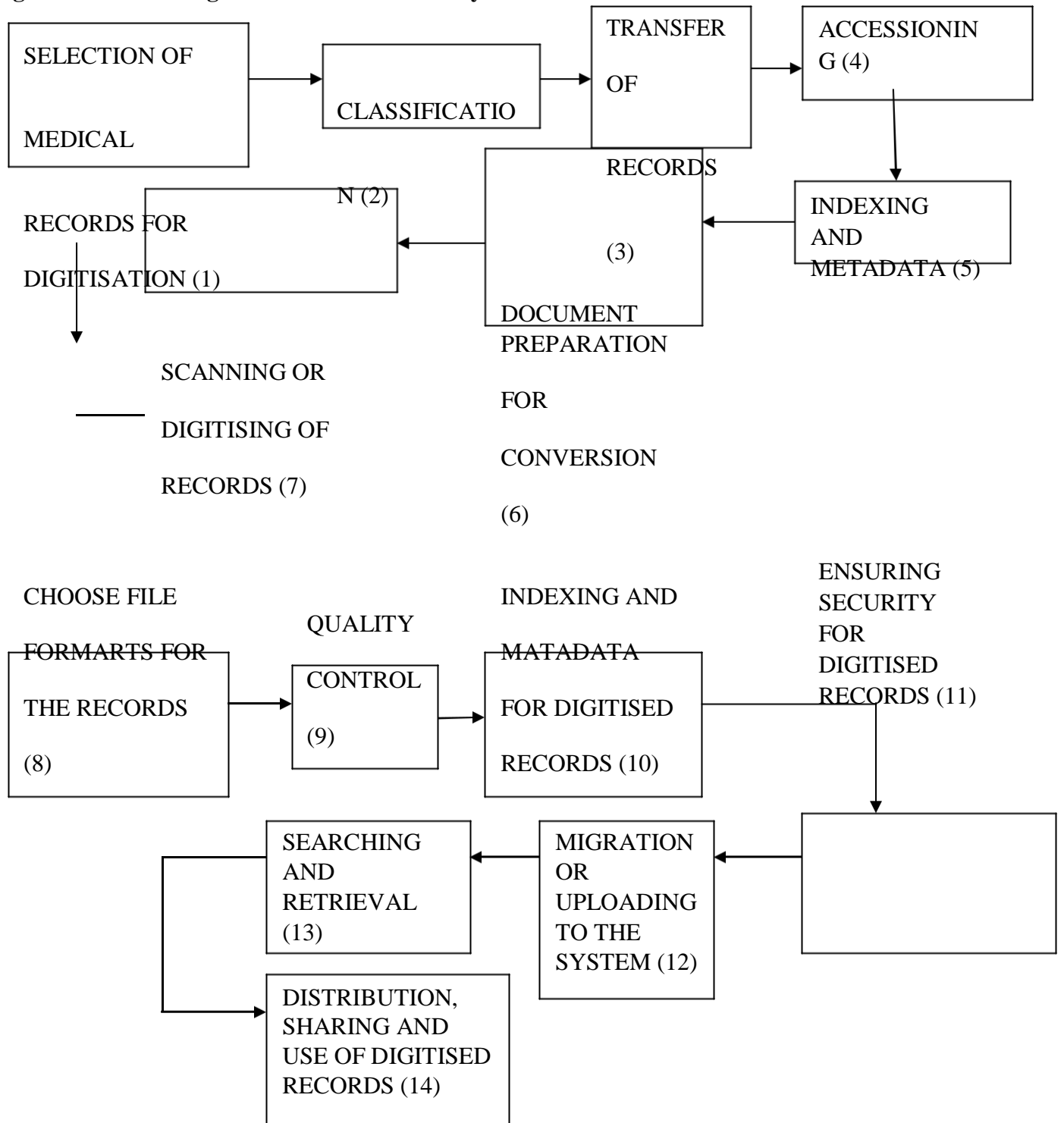
This manual applies to the medical records department's employees at all levels involved in the digitisation of manual medical records.

5.5. Introduction

Careful consideration of several questions will facilitate the design and implementation of successful digitisation. A digitisation project can result in different products and services. Many hospitals always plan to digitize their collections but lack experience and there is a need for a practical guide as a working tool for planning digitisation projects. Furthermore, this need is particularly felt in developing countries. Many guidelines have already been created by national and international organisations and more can be created with legal and ethics in the management of medical records. The organisation plays an important role in the management process of digitisation.

Fabunmi and Paris, (2006) reported that technical requirements and implementation should be considered when digitising materials. Technical requirements and implementation are divided into three important elements which include conversion, quality control, and collection management. The digitisation of records should follow a laid down process to attain a goal-oriented objective.

Figure 5: Records Digitisation Process or life cycle



Below are relevant guidelines following the digitisation process or life cycle according to the different literature;

5.6 Process 1: Selection of medical records for digitisation

Since digitising every single medical record is unrealistic and expensive, medical records officers should use selection criteria for digitisation. In choosing wisely, organisations focus on facets of their collections that are best suited to digitisation, make effective use of technology, and meet researchers' needs. Digitisation guidelines allow institutions like Entebbe Regional Referral Hospital to articulate how they will use digitisation to support their missions. In addition, organisations can use these

guidelines to build consensus about what criteria will guide the choice of projects and programs” growth. Medical records officers build online collections that provide the most research value, sustainable over time.

5.6.1 Guidelines relevant to the selection of medical records

1. Condition of materials

Fragile and damaged materials that are in poor condition may present too many risks of further damage being caused by handling if they are scanned without special care and basic treatment. Therefore, the medical records staff should consider this kind of records as the priority for digitisation since they already deteriorated.

2. Information Needs

Patient records for digitisation should meet the hospital’s information needs that increasingly demand special collections materials for better access. The judgment used for collection unique development can also evaluate the intellectual quality of items or collections to be digitised. Since the cost of digitisation projects is so high, the work must focus on digitizing the most useful materials that meet users’ information needs rather than the detail of lesser used, less popular, or derivative materials.

3. Use of the medical records

If the patient records have a high frequency of demand because they meet user information needs, they may qualify for digitisation. Suppose visitors have always accessed a physical collection, but items are no longer available because the storage area is closed. In that case, the materials after digitisation may be even more useful for remote users.

4. Value of the medical records

There should be the digitisation of high-value items for preservation and security. Value is gauged monetarily by the uniqueness of the material and its importance to the community served by the hospital. The interests of funding agencies or grant providers can also assess value. Records staff should query their stakeholders as to what

collections are most valuable to the organization so that they are considered before digitisation.

5. Preservation of medical records

Patient records that have preservation problems because of inadequate housing, physical damage, fragility, size, or outdated formats also qualify for digitisation. An added benefit is that providing alternative access to the information decreases the handling of original materials, facilitating preservation.

6. Costs

If physical patient records are costly to retrieve, then suitable digital versions may be more cost effective. Digital access can save money because it reduces the need for employees to supply retrieval services.

7. Processed Collections

Patient records that are already organized, described, and processed with proper metadata, should be given higher priority than unprocessed collections. In most cases, processed collections signify that they meet the above criteria for information needs, use, and value. Since the information is already there, digitisation is just one more step to increased accessibility.

8. Thoughtful decisions about the medical records

No organisation's repository can digitise everything it owns. Thoughtful decisions arise from assessing the nature and content of materials, the patient's privacy rights, the requirements for items that provide the users' need for access to the content as well as the institution's need to preserve materials of enduring value.

Therefore, Selection works best within a matrix of priorities for the digitisation of medical records.

5.7 Process 2: Classification of medical records

A file classification scheme (also known as a file plan) is a tool that allows classifying, titling, accessing, and retrieving records. It is presented as a hierarchical structure of classification levels and is based on the hospital activities that generate records in a specific organisational business setting.

5.7.1 Guidelines relevant to the classification of medical records

Classification of records helps to determine baseline security controls appropriate for safeguarding a specific record. All hospital records should be classified into three basic security levels such as secretive records, administrative records, confidential records, personnel records, and public records like information on the notice board that is meant for public use.

1. Reasons for classification

Classification of medical records facilitates retrieval, description, control, access status as well as determining their disposition. The development of a file classification scheme is based on an analysis of the functions and activities undertaken by an organisation. To keep related documents and records together.

- To make it easier to find the information during retrieval.
- To provide context for individual documents and records.
- To standardize titling terminology for searching.
- To help users acquire knowledge in organizing records.
- To identify the management responsibility for a group of records.

The main responsibility for the development of a file classification scheme for records that are evidence of hospital activities of the organisation lies with individual medical departments. To start, the digitisation team should conduct an analysis of the medical records department functions and activities resulting in setting up major groups-functions and their sub-groups - activities. In doing so a variety of methods may be used, we do recommend consulting the medical records department mandate, any policy document, and available standard operating procedures. Interviews with

colleagues in the medical records department may help in understanding the major tasks performed to accomplish each of the identified functions. It is recommended to consult the existing classification schemes to determine common substantive functions and re-use these structures in developing new classification schemes.

When classifying a collection of records, the most restrictive classification of any of the individual record elements should be used. For example, if a collection consists of a patient's name, address, and reference number, the collection should be classified as Restricted even though the patient's name and address may be considered public information.

2. Reclassification

It is important to re-evaluate the classification of medical records to ensure the assigned classification is still appropriate based on changes to legal and contractual obligations as well as changes in the use of the medical record or its value to the organisation. This evaluation should be conducted by the appropriate method.

The method of classification determines what frequency is most appropriate based on available resources. If a method determines that the classification of a certain data set has changed, an analysis of security controls should be performed to determine whether existing controls are consistent with the new classification. If gaps are found in existing security controls, they should be corrected promptly, commensurate with the level of risk presented by the gaps.

3. How to classify information

File classification is especially beneficial if the hospital has multiple departments and staff from one department must locate documents in a separate department. File classification is organised by:

- Primary Heading – typically by department
- Secondary Heading – types of documents in that department
- Tertiary Heading – further definition of documents such as by year.
- Creating labels for paper file folders in a paper filing system

- Filing documents within paper files and folders

File classification also involves determining the retention and security of the documents. This process must be performed before the installation of an electronic document and records management system but is also very useful for paper-based systems.

5.8 Process 3: Records transfer

5.8.1 Guidelines on records transfer

There is a need for transfer guidelines on preferred medical records recommended for digitisation.

Steps for transferring paper medical records from the storage area to the digitisation room

1. After the identification of the files that are to be transferred to the digitisation room by the medical records officer, a transfer list should be created, filed, and presented to the head of department who makes clear approval that these files are in the state of being transferred to the digitisation room.
2. After the verification of the files, they are arranged according to their categories of the reference numbers and years of creation where files created in the same year are arranged near each other and also files of related programs are arranged together.
3. Files should then be packed in boxes based on the above arrangement, in this process files that have related class numbers should be packed in boxes in descending order where the file with the highest class is put at the top and the one with the least is put at the bottom with considerations of the categories that are of different reference numbers and years should not be mixed.
4. Labelling of the boxes is done with bold markers with „the names of the department and year of file creation.
5. Boxes are also assigned sequence numbers like 1, 2, 3, 4, and 5.... basing on their amount to simplify their identification when needed.
6. Verification of the boxes should be done properly and each piece of information of the box should be entered in the records transfer list for the medical records department with files packed in it well indicated and their required tracking details like the file names, numbers

and the department and the transfer list should be kept by the senior medical records officer.

7. Boxes should be carried by the authorised digitisation team to the digitisation room and kept in the vacant spaces available in each category section based on the flow of their sequence numbers assigned to them during labelling.
8. The digitisation room should be safe, secure, clean, efficient, and economical

5.9 Process 4: Accessioning of records

Accessioning is the act of taking physical and legal custody of a group of records or other material and documenting their receipt. All records acquired in the digitisation room should be accessioned or recorded in an accession register.

5.9.1 Guidelines on accessioning of records

1. Accessioning is the act of taking physical and legal custody of a group of records or other material and documenting their receipt. All records acquired in the digitisation room should be accessioned or recorded in an accession register.
2. An accession register is a complete record of all collections acquired and accessioned into the digitisation room. This register must be kept in a safe place preferably in a fireproof cabinet and a copy must be kept in another building. Entries must be written in permanent ink only.
3. Accessioning will represent an opportunity for the digitisation team to gain basic physical and intellectual control of material, and in this way, accessioning forms the basis of any good collections management apparatus. An accession register is a foundation for description.
4. Accession records are kept in a variety of systems including Excel, Access, and even analogue systems like cards and accession books. Independent of where and how the accession records are kept, it's critical that the record be standards-compliant and easily exchanged or interoperable with a system for discovery and access. An accession register can include the following information: reference code/ number, name of digitisation

department, title, date received, name of creating department, scope and content, conditions governing access to the medical record.

Figure 6: Showing an accession register for ERRH (medical records department)

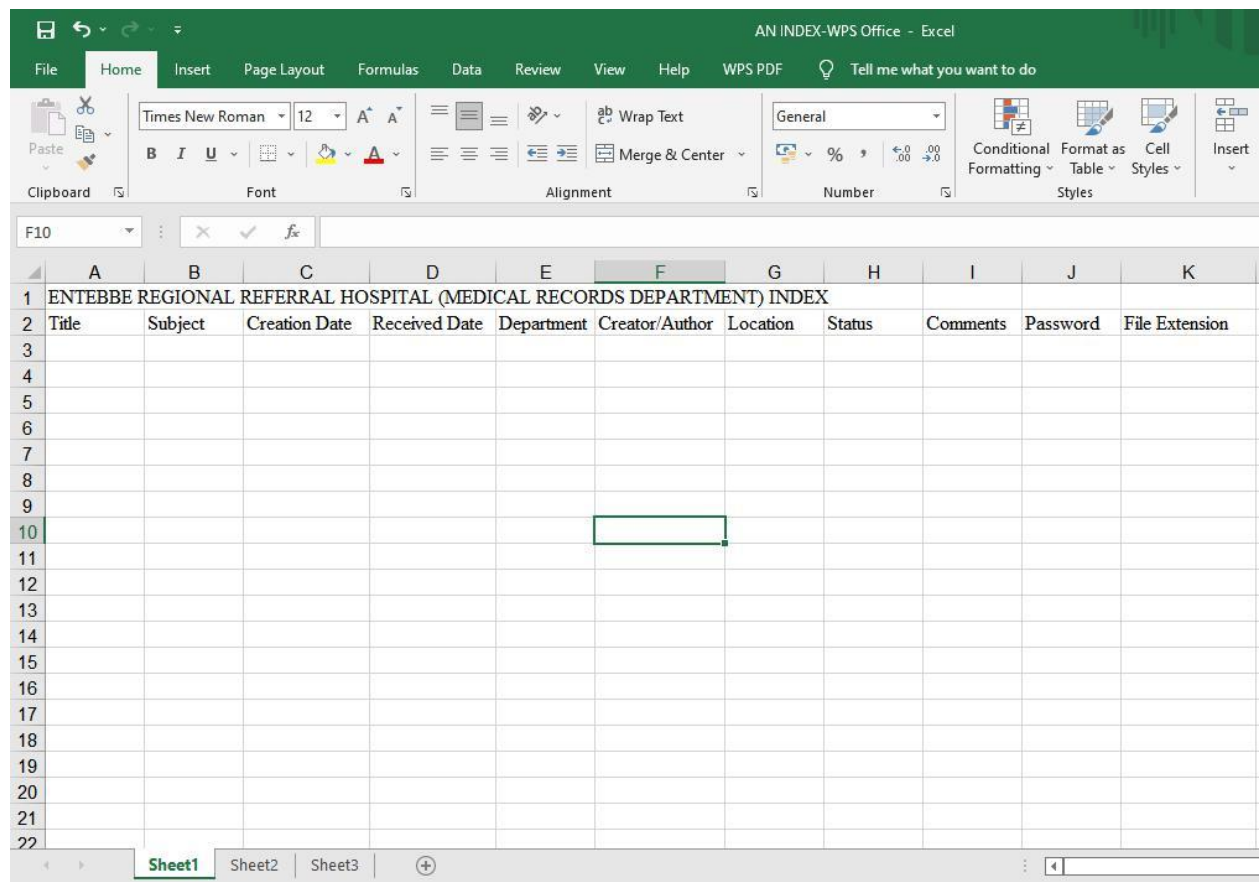
1	AN ACCESSION REGISTER FOR ERRH (MEDICAL RECORDS DEPARTMENT, DIGITIZATION)					
2	Ref number	Receiving Department	Title	Received Date	Scope & Content	condition governing access of the medical records
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						

Source: Primary data 2022

5.10 Process 5: Indexing and metadata

Indexing is the process of capturing relevant metadata associated with the records. Some of the metadata is used to index the records to make retrieval easier and is also used for later management of medical records. Excel sheet can be used for indexing as seen below;

Figure 7: Showing an index for ERRH (medical records department)



Source: Primary data 2022

Metadata

Metadata is usually defined as "data about data," which is used to describe an object (digital or otherwise), its relationships with other objects, and how the object has been and should be treated over time. Metadata allows users to locate and evaluate data without each person having to discover it several times. A structured format and a controlled vocabulary, which together allow for a precise and comprehensible description of content, location, and value, are its basic elements.

5.10.1 Guidelines on indexing and metadata

Metadata categories and functions

Metadata is generally categorized into four or five groupings based on the information the metadata captures, as described below:

- **Descriptive Metadata:** Metadata that describes the intellectual content of a resource and is used for the indexing, discovery, and identification of a digital resource.
- **Administrative Metadata:** Metadata that includes management information about the digital resource, such as ownership and rights management.
- **Structural Metadata:** Metadata that is used to display and navigate digital resources and describes relationships between multiple digital files, such as page order in a digitized book.
- **Technical Metadata:** Metadata that describes the features of the digital file, such as resolution, pixel dimension, and hardware. The information is critical for migration and the long-term sustainability of the data resource.
- **Preservation Metadata:** Metadata that specifically captures information that helps facilitate management and access to digital files over time. This inherently includes descriptive, administrative, structural, and technical metadata elements that focus on the provenance, authenticity, preservation activity, technical environment, and rights management of an object.

Recording the above various types of metadata may support a variety of functions for government agencies, but the primary uses are for; Legal and statutory reasons (e.g., to satisfy records management laws and the rules of evidence), Technological reasons (e.g., to design and document systems), Operational or administrative reasons (e.g., to document decisions and establish accountability), Service to citizens, agency staff, and others (e.g., to locate and share information). A structured format with a controlled vocabulary when appropriate should be used when capturing metadata. “Structured format” means the metadata is defined in terms of specific, standardised elements or fields, based on the document type. Controlled vocabulary means that there is an approved or standard set of terms that can be used as content for each metadata element because it ensures consistency across a collection and allows items to be found easily and compared.

Metadata capture

Before digitisation, the metadata of all the incoming medical records delivered to the digitisation facility should be captured, for example, in a central medical records

administration system like registers and report books by recording the patient identification and respective case identification. A short turnaround time is recommended because if a medical record is needed on short notice or it's misplaced, it can quickly be determined whether it is already in the process of being digitised.

Based on the Web Metadata Standard which uses the Dublin Core metadata standard for example, Dublin Core metadata elements can be used as a metadata standard that helps you find exactly what you're looking for by organizing the contents for easy access and retrieval.

The metadata that can be captured using the Dublin core include;

- **Title.** The name of the resource given by the creator or publisher.
- **Creator.** The name of the person who created the resource.
- **Subject.** The topic of the resource.
- **Description.** A short, text description of the resource's contents.
- **Publisher.** The name of the entity that published the resource (for only resources published online). Note that the publisher is not the person who posted the resource to the website, but the entity responsible for the publication of the resource, such as the inpatient department of Entebbe Regional Referral Hospital.
- **Contributor.** Someone aside from the creator who made a significant contribution to the resource.
- **Date.** Either the creation date, received date, or publication date. Your agency will need to determine which date to use.
- **Resource Type.** The category the resource belongs to, such as committee minutes, reports, out-patient and, Inpatient records.
- **Format.** The file format of the resource. For example, paper or electronic.
- **Identifier.** A text string or number unique to the resource, such as patients' unique identification number or personal information.
- **Source.** Information about the source from which the current resource is derived (e.g., an abstract of a report).

- **Language.** The language used in the resource (e.g., English, Spanish).
- **Relation.** An element that refers to related resources.
- **Coverage.** Either geographic (e.g., Minnesota) or temporal (e.g., the years 2000–2001).
- **Rights Management.** A text statement regarding copyright and use permission.

5.11 Process 6: Document preparation for conversion

Before digitisation, medical records should be prepared and the following guidelines or procedures should be followed;

5.11.1 Guidelines for document preparation for conversion

1. Remove staples, pins, clips, and, tapes

Documents must be entirely separate from one another before scanning. All document scanners have a glass interface between the document and the scanning array. This glass such as a flatbed is vulnerable to damage from metal objects such as staples and pins which can scratch the glass of the scanner causing permanent streaks in subsequent scans which may require the replacement of the glass. Scanners with document feeders move the paper at high speed, so any document that mis-feeds or jams will be damaged – either torn, crumpled, or marks left from skidding feed rollers.

Figure 8: Showing a person removing staple wires from a record



Source: Primary data

2. Group and index files logically

Attempt to group and index files logically using a hierarchy system that makes sense for your department and the type of files or contracts the organization intends to store on the cloud. Index your files based on priority, file type, and sensitivity because it can help with the organization process before sending or sharing your records with a different department or medical officer.

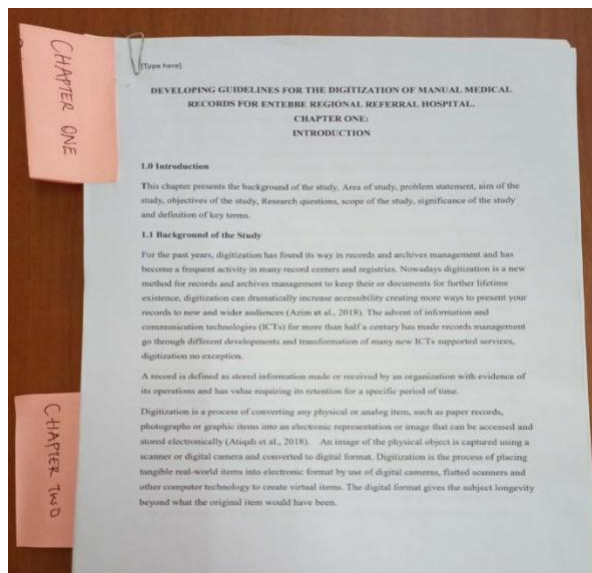
Information covered by sticky notes or bent corners should be uncovered and the information on the sticky notes should be recorded.

3. Insert a separator sheet (in good condition)

The patient records of an individual patient should be separated by dividing sheets or processing independently of one another. During the digitisation process, it is imperative to prevent different patient records from being mixed up inadvertently.

Often, scanning software uses specially marked sheets to separate documents. These are inserted wherever you need a new PDF to start – either a new file or a new document.

Figure 9: Showing a sample of a separate sheet



Source: Primary data

4. Different sheets from the same document (e.g., multi-sheeted doctor's letters or laboratory findings) should not be separated from one another during digitisation.

However, sensible sorting of the documents contained in a record can take place before digitisation and indexing. If the documents in a medical records department are summarized into classes (e.g., doctor's letters, laboratory findings, and so forth), the already-existing document order of the paper medical record should be maintained within the document class, given that there is no indexing of the documentation times.

5. There should be a clear procedure for the dividing-up and digitisation of oversized documents that ensures the documents can be unambiguously re-assigned to each other after digitisation.

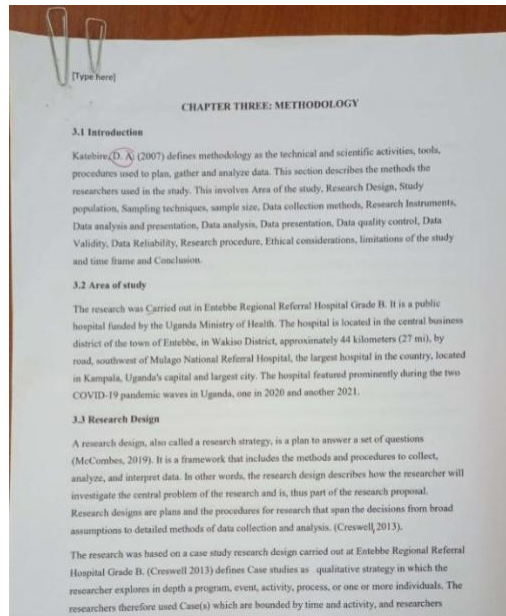
- Reposition and secure documents with information overlapped. Post-it notes (or other papers like sticky notes) should be (re)positioned so that they do not obscure information on the page. Loose items attached to documents can cause jams which in turn may damage the documents. Post-it notes need to be secured with extra tape to ensure they do not detach during document transfer.

Check documents for sequences/ completeness and take steps as required. Some documents may be out of sequence or have pages missing – best to check and correct them before scanning.

6. Align documents on top or side edge and secure with a fold-back clip

Aligning the pages to the top or side edge will help the document feeding mechanism pick up one document at a time – which will help avoid multi-feeding or jamming.

Figure 10: Showing a document aligned on the side edge using a fold-back clip

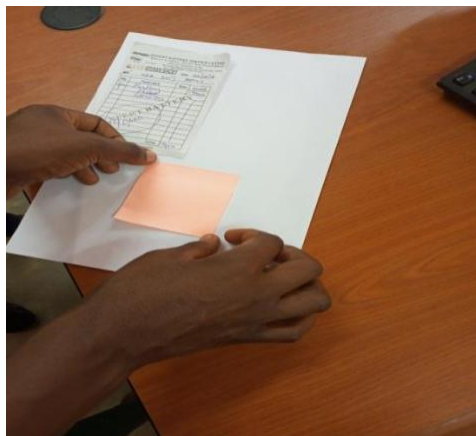


Source: Primary data

7. Stabilize fragile, damaged, or undersized documents by using tape.

Document feeding mechanisms can be destructive if documents are damaged. Taping or trimming will help prevent this (photocopying may also be an option – if the document is in extremely poor condition). Extremely small documents like sticky notes and compliment slips can be taped to either front or back of related documents (ensuring no information is obscured).

Figure 11: Showing a person taping undersized fragile documents

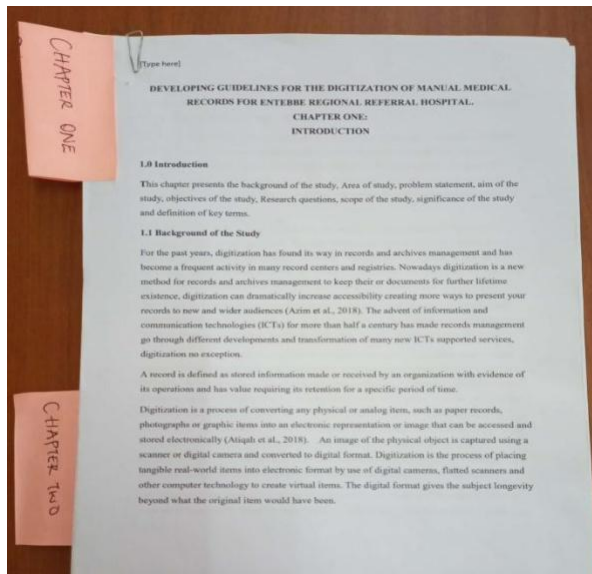


Source: Primary data

8. Flag documents to be unfolded before scanning (i.e., A3 or A4)

Occasional larger documents can be folded to facilitate stacking and transfer, but a flag like a post-it note should be attached, so the scanner operator can unfold the document before scanning.

Figure 12: Showing unfolded documents separated with a sticker note



Source: Primary data

NB: If paper-based medical records or other kinds of source documents (e.g., X-rays), are not digitized, but rather stored conventionally, this should be precisely regulated and described. It must be possible to locate separate medical records on short notice when needed by administrators and medical records users.

5.12 Process 7: Medical records conversion/ digitisation/ scanning

5.12.1 Guidelines for digitising of medical records

- Once your document preparation process is complete, you can begin working with the document conversion provider directly. First, you will need to provide your file digitalization solution provider with your files. Once your preferred team has the documents in hand, they will begin the following steps:

- The digitisation process should be designed in such a way that damages to the source document that might have led to information loss are recognizable as such. The digital copy may not give the impression that the affected document sections did not contain any information.
- Flattening and physically organizing documents for the scanning and conversion processes.
- Create a custom scanning protocol for your documents based on volume and document or file type.
- Develop and define scanning templates that are unique and individualized for the organization's (hospital) needs. These templates also help save time and increase efficiency when scanning multiple documents using the same format and template.
- Scan documents using a high-resolution setting for 300 DPI (dots per inch) image files. Your documents will typically be scanned into your preferred image file or a standard PDF file.
- The front and reverse sides of a sheet should be digitized together.
- Blank sides should be saved in the system and then hidden later, or they can be removed based on a precisely controlled and documented procedure that can verifiably ensure no loss of information.
- When using feed scanners, it should be ensured that no more than one sheet is pulled in at a time.
- Color-coded information should also include these colours in the digitized record
- If any problems concerning the record content or structure are identified during the digitisation process (e.g., different patients' records being combined), the record should be returned to the document owner for clarification. Said return, along with the time, processor, and reason for return should be centrally documented.
- It needs to be ensured that the entire numbers of documents in a file are present and have been processed completely and correctly.
- Compliance with the requirements for the creation of certified copies by the section „Originality“ in „Regulatory requirements“ should be documented in an

appropriate way (preferably by electronically signing every digitized record). However, paper-based documentation for every generated record would be possible or – according to the European Medicines Agency’s Reflection Paper and the CDISC definition of a certified copy – a validation of the digitisation process.

□ A procedure that makes it possible to digitize and add subsequently filed documents (e.g., from a treatment case) to an already-digitized record or treatment case should be established and described. This is relevant, for example, when a laboratory finding for a treatment case arrives at a ward after the associated record has already been approved for digitisation.

5.13 Process 8: Indexing and assigning of metadata after digitisation

5.13.1 Guidelines for indexing and assigning metadata after digitisation

After paper-based records have been digitised, they should be indexed and fed into the digital medical records system along with a reference to the individual patient or treatment case, to allow easy retrieval of digitized medical records using the patient’s identification. Other possible options include searching by case identification or the name of the patient. In addition, it is recommended to use other metadata (e.g., treatment date, author, and document class) for indexing. These must be determined before starting the digitisation process. The determination as to which metadata will be used is very important for later work with the digital records and should therefore reflect the users’ requirements concerning retrieval and access to the stored documents. The indexing of electronic documents thus has the same basic purpose as placing paper documents into different folders within a paper record. Additionally, indexing allows for a deeper record structure and a greater variety of access possibilities.

As manual indexing is very time-consuming and expensive, automated indexing usually makes sense. Information such as patient identification, document type, or author can be encoded in the documents in advance or read using barcode recognition during indexing. Using optical character recognition technology, textual information could also be digitised for use in indexing. Furthermore, it is common practice to use dividing sheets containing encoded information within records, which can be recognised using barcodes or optical character recognition during digitisation and used to create document classes within a digital record.

There are three methods of capturing metadata for electronic records or files such as using an automated index like excel sheets, showing a document panel, advanced properties, and folder method as explained below;

Figure 13: Showing an index for ERRH (medical records department)

	A	B	C	D	E	F	G	H	I	J	K
1	ENTEBBE REGIONAL REFERRAL HOSPITAL (MEDICAL RECORDS DEPARTMENT) INDEX										
2	Title	Subject	Creation Date	Received Date	Department	Creator/Author	Location	Status	Comments	Password	File Extension
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											

Source: primary data 2022

1. Show document Panel

Microsoft documents like word documents excel documents, etc.

- Select the file you want to capture the metadata
- Double-click to open the file
- Click file> File info
- Click properties> Show document panel
- Fill out the form based on the information or data required or needed. The form contains information such as author, title, subject, keywords, category, status, and, comments.
- Click **save** to save the metadata captured

Figure 14: Showing metadata capture using show document panel method



For PDF documents, follow this

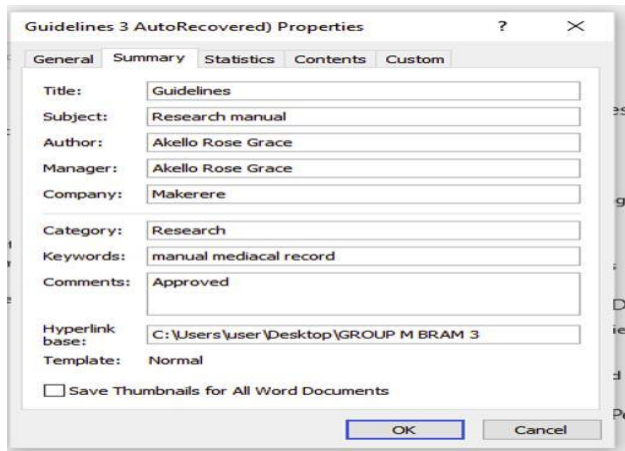
- Choose the file> Properties
- Click the description tab
- Click additional metadata
- Select advanced from the list on the left
- Save the document metadata and click ok
- To save the metadata on an external file, click save and name the file.

2. Advanced properties

- Select the file> Double-click to open the file
- Click file> File info
- Properties > Advanced properties
- Advanced properties have many attributes such as General, summary, statistics, contents, and custom. Click on the one you want to use.

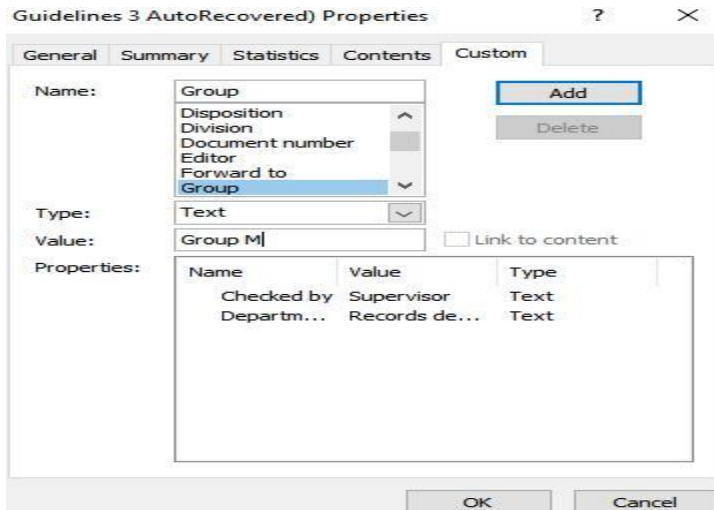
For example, the Summary attribute contains many fields which include; Title, subject, author, manager, company, category, keywords, comments, and hyperlink base (got from where the file is saved).

Figure 15: Showing metadata capture using advanced properties method (summary attribute)



Source: Primary data

Figure 16: Showing metadata capture in custom attribute



Source: Primary data

The summary attribute asks what the document is all about.

Statistics attributes give the numerical data of the file or document.

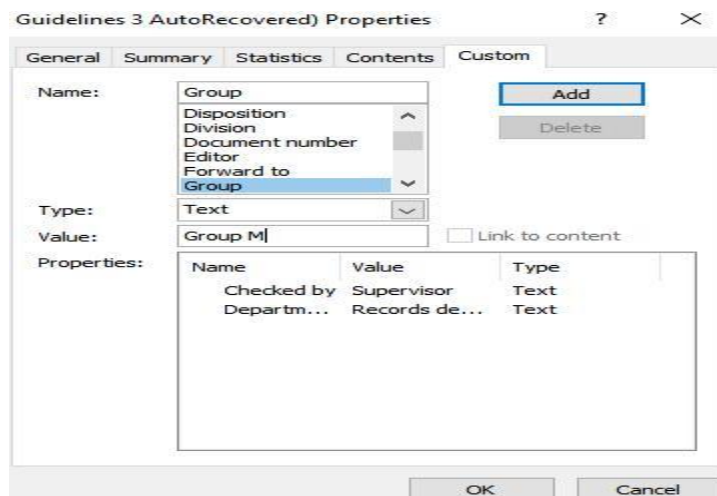
The content shows the information found in the document or file.

Custom attribute: Has many fields which allow the user to add the metadata he or she wants like checked by, client, date completed, department, and destination . **NB: When customizing,** do the following.

Highlight what you want to customize> enter data type like date, number, text, and yes or no Click add> Click Ok> save and then close

NB: Delete is for deleting what you do not want by highlighting and then click delete.

Figure 17: Showing how to customise metadata

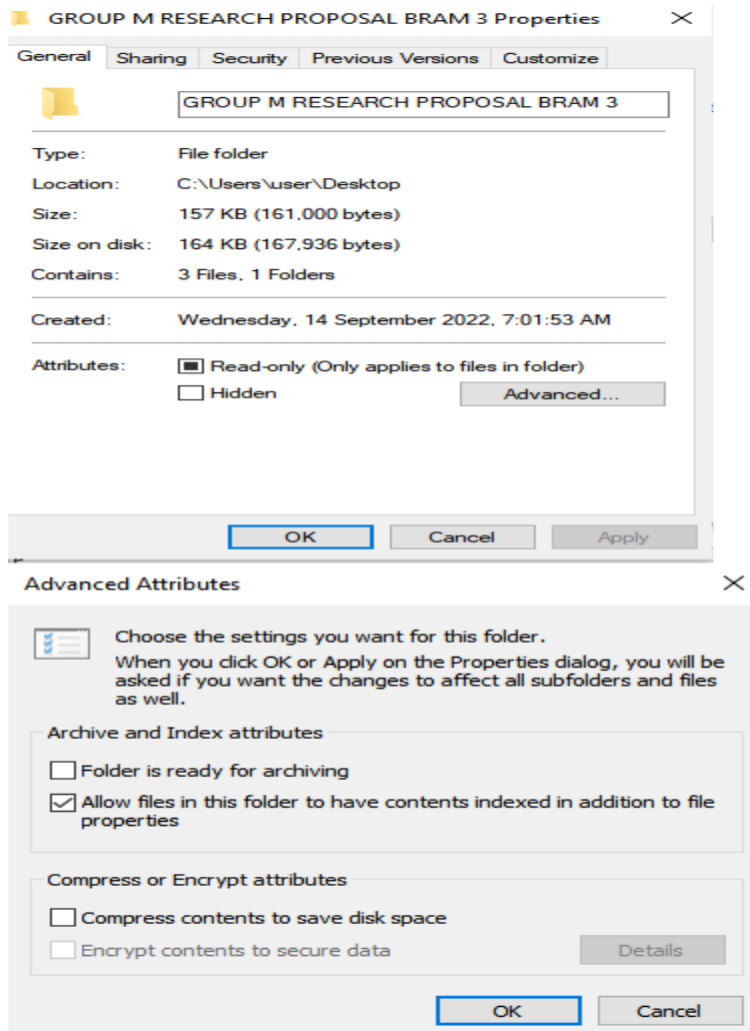


Source: Primary data

3. Folder method

- Select the folder you want to capture metadata and where the documents are saved.
- Right-click on a file> Select Properties
- Properties contain attributes like general, security, custom, details, and the previous version.
- Select any attribute you want
- In general, it has fields like type, location, size, contains, the size on disk, created, and other attributes.

Figure 18: Showing metadata capture using folder method



Source: Primary data

5.14 Process 9: Security of medical records after digitisation

5.14.1 Guidelines for security of medical records after digitisation

1. **Boxing**, in this case, the files should be put in the boxes that are indexed with numbers following the period when the record was created.
2. **Installation of digital cameras/ CCTV** in the digitisation room and access points to enable easy monitoring of medical records digitisation, movement, and authentication. Someone seats at a certain point where he or she can view whatever is taking place in the records centre.

Figure 19: Showing an image of digital CCTV camera



Source: Primary data

Digitised documents should be secured by a digital time stamp to make verifiable the integrity and authenticity of the data over an extended period. If algorithms used to calculate the hash values and used for encryption lose their validity, an update of the data's timestamp is required (A hash value can be seen as a number that is the fingerprint of a digital record. This unique number is calculated based on a mathematical function and the record itself. Even a slight change in the record would lead to a different hash value. A digital time-stamp makes use of a record's hash value and proves that the record has been unchanged since the timestamp was generated).

3. Access control - Refer to policies and procedures an organization (hospital) uses to prevent improper access to the system. Access control only allows the authorized person to access and use the system; this can be the use of passwords and codes.

4. Installation of security software e.g., antivirus, spyware, and firewall, to avoid viruses, worms, and the Trojan horses that disable information systems.

5. Securing wireless networks, organizations can further improve the wireless networks by using it in conjunction with Virtual Private Network (VPN) technology when a wireless network has access to internal corporate data. The Wi-Fi alliance industry trade group issued Wi-Fi protected access (WPA)

NB: Remember institutional data should be availed at only the Intranet network

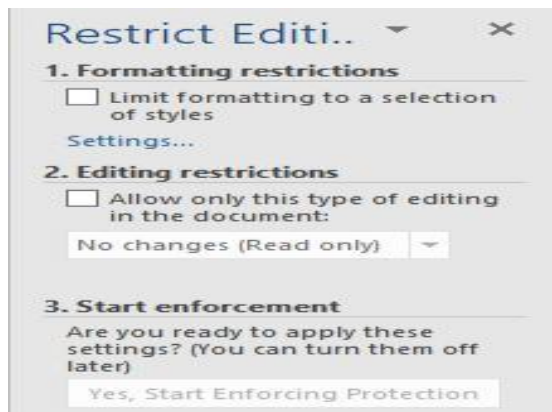
6. Data encryption, encryption is especially useful to shield messages from public networks because they are less secure than private networks. Data in the system can be encrypted by using passwords, adding a digital signature, restricting access, editing, and marking it as final.

Figure 20: Showing how to encrypt the document using password



Source: Primary data

Figure 21: Showing how to restrict editing of the document



Source: Primary data

To encrypt PDF documents, the following procedures should be followed.

- Double-click to open the PDF document or file in Acrobat reader
- Choose Tools
- Click protect
- Encrypt
- Encrypt with password or security method desired> Enter password> Confirm
- Click “**OK**” and then click save.

How to encrypt the folder, follow these procedures;

- Navigate the folder or file you want to encrypt
- Right-click on the item
- Click Properties
- Click advanced
- Click encrypt content to secure the Data
- Click OK
- Finally, click apply

How to encrypt, lock, and protect TIFF files with password using (idoo software)

First, download and install the software, then follow the following procedures;

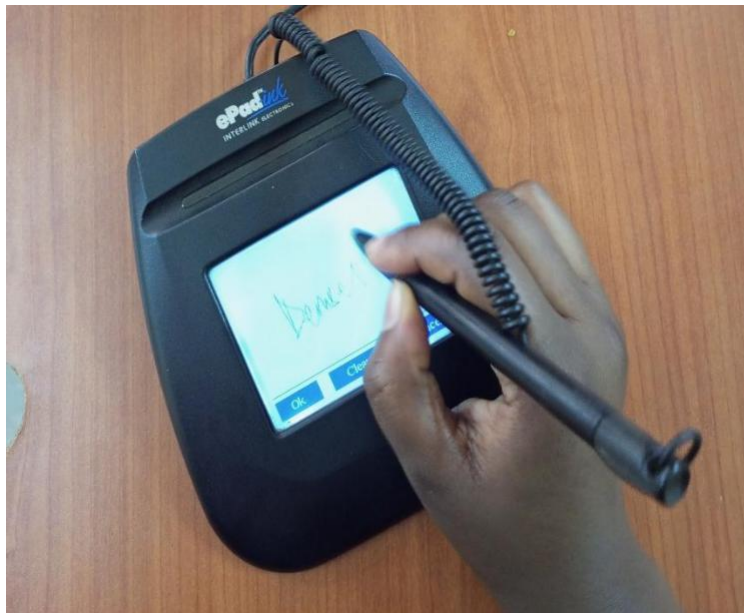
- Right-click the file or folder you want to encrypt.
- Click the menu item “idoo File Encryption”
- Encrypt it
- Set a password for the TIFF file and click the “OK” button

NB: The passwords should be kept in a safe place because they will be required every time you access the document.

7. Digital signatures and digital certificates, help with authentication. The electronic signatures in the global and electronic transaction Act of Uganda have given digital signatures the same legal status as those written on paper.

The e-pad family of electronic signature pads enables you to sign, send, and store documents electronically without the need to print or scan paper forms.

Figure 22: Showing a person entering a digital signature



Source: Primary data

8. Installation of detection systems like alarms that can create awareness among the staff in case an unauthorized person tries to access the digitisation facility and retrieve the files.

9. Information backup, different forms of information can be recovered through the use of maintenance of appropriate backup copies on the different backup equipment such as CDs, DVDs, Flash disks, and online storage.

To enhance software reliability, there are different records management software. For example; specialized ERM software e.g., HP Trim, Share point, ZYLAB. Database management systems e.g., MS Access, SQL, Oracle, and visual basic.

5.15 Process 10: File formats to be used after digitisation

5.15.1 Guidelines on file formats to be used after digitisation

Rapid changes in technology mean that file formats can become obsolete quickly and cause problems for your records management strategy. A long-term view and careful planning can overcome this risk and ensure that you can meet your legal and operational requirements. Legally, your records must be trustworthy, complete, accessible, legally admissible in court, and durable for as long as your approved records retention schedules require. For example, you

can convert a record to another, more durable format (e.g., from a nearly obsolete software program to a text file) and that copy, as long as it is created in a trustworthy manner, is legally acceptable. (US National Archives and Records Administration January 1998)

The software in which a file is created usually uses a default format when the file is saved. This is indicated by the file name suffix (e.g., PDF for portable document format). However, most software allows authors to select from a variety of formats when they save a file. For example, Microsoft Word allows the author to select document [DOC], Rich Text Format [RTF], or text [TXT], as well as other format options. Some software, such as Adobe Acrobat, is designed to convert files from one format to another. The format you choose will affect your long-term records management abilities.

When choosing a file format to use for your electronic records management purposes, it is important to understand how proprietary, non-proprietary, open formats and open standards may affect the accessibility and accountability of your records over the long term.

- Proprietary formats. Proprietary file formats are controlled and supported by just one software developer. Microsoft Word (.DOC) format is an example.
- Non-proprietary formats. These formats are supported by more than one developer and can be accessed with different software systems. Extensible Mark-up Language (XML) is a popular non-proprietary format for government records.
- Open-Source formats. In general, open source refers to any program whose source code is made available for use or modification as users or other developers see fit. Open-source formats are published publicly available specifications for storing data which are often maintained by a standards organization. Open formats can be used by proprietary and open-source software alike.
- Open Standard formats. Open standard software formats are created using publicly available specifications (open-source formats). Although software source codes remain proprietary, the availability of the standard increases compatibility by allowing other developers to create hardware and software solutions that interact with, or substitute for, other software.

Note, M. (2018) goes ahead and suggests the following about file formats and resolutions;

Digital images are saved in a file format that is to say; the structure by which data is organized in a file. Despite the range of file formats, only a few are recommended for digitized collections. The most common formats include TIFF (Tagged Image File Format), JPEG (Joint Photographic Experts Group File Interchange Format), PNG (Portable Network Graphics), and GIF (Graphic Interchange Format). Many digital image collections use TIFF master files and JPEG derivative files.

TIFFs

The “tagged” in TIFF refers to the internal structure of the format, which allows for arbitrary additions, such as custom metadata fields, without affecting general compatibility. These tags describe the size of the image or define how the image data is arranged and identify the compression algorithm that is used. TIFF supports several types of image data compression, allowing an organization to select the most appropriate for their needs, and many users of TIFF opt for a lossless compression scheme such as Lempel-Ziv-Welch (LZW) encoding, to avoid degradation of image quality during compression. Users often avoid any compression at all, an option TIFF readily accommodates, to ensure that image data will be simple to decode. TIFF is the best file format for archiving high-quality images, because files may be edited and saved without damage.

JPEGs

JPEG is a lossy compression format that allows image data to be compressed by assigning a compromise colour value to a block of pixels rather than to each separate pixel. The extent of this process can be controlled, but there is irretrievable deterioration in image quality, most noticeably in smooth gradient areas. JPEG is best used with continuous-tone photographic images, destined for email and web use, or storage when space is limited. It is not suitable for use with line drawings.

GIF

GIFs are best used to store screen-quality images that do not contain many colours. GIF files are typically very small, but cannot reproduce the range of colours necessary to reproduce

photographic images like JPEG. As such, this format is recommended for used copies of text records

PNG (Portable Network Graphics)

Portable Network Graphics is an open standard graphics file format that allows accurate rendering of greyscale and RGB colour objects. PNG format can be used to store high-colour images, which means it is also suitable for storing photographic content. This format is not widely implemented.

PDF (Portable Document Format)

A portable document format is best used to store vector-based graphics (i.e., graphics drawn using lines and curves rather than pixels). Vector graphics stored in PDF format will be much smaller, will read more cleanly, and any included text will be searchable. Equations, charts, and diagrams that combine text with vector graphics are particularly appropriate to store in PDF format.

PDF/A

PDF/A is a special type of PDF format meant for documents needing to be preserved for long periods. This format is an ISO standard which helps guarantee that it will be accessible in the future as technology advances.

Table 4:showing Recommended formats for digitised records

Preferred formats for the digitized records	Format versions
Tagged image file format (TIFF)	4,5 and 6
Jpeg2000 (JP2)	Part 1 (JP2)
Portable Network Graphics (PNG)	1.2
Portable Document Format/Archival (PDF/A)	PDF/A-2

Resolution guidelines for digitised patient records

Resolution refers to the quality of an image. The higher the PPI, the more accurate rendering of the original document is created. Images at low PPI may look fine on a computer screen but will be illegible when printed out. High-resolution images capture more information about the original document and therefore take up more server space in terms of storage. PPI will also vary depending on the object being scanned. An 8x10 photograph will most likely require a different resolution than an 8x10 text document.

Benefits of Low-Resolution Images

Monitors display images between 72 and 100 dpi, depending on the type and quality of the display, with top models displaying 200 dpi, in which the pixels blend to the human eye, presenting a smooth image. If preparing images primarily to be displayed on the screen, such as a website, low resolution is suitable. Low-resolution images online also have the added benefit of preventing the usage of the images for commercial printing.

Low-resolution images also allow information to be shared quicker, whether emailed, posted online, or embedded in a document. Copies of the larger digital surrogates allow for ease of access.

Benefits of High-Resolution Images

Printed images require 300 dpi to replicate the sharpness of conventional photographs. Most inkjet printers are capable of producing 300 to 1200 dots per inch. When creating digital images for print, it is useful to know the printing technique and output resolution.

High-resolution images should always be 300 dpi; the size of the file depends on how large you will need the images

Resolution and Image Size: Textual Documents and Maps/Plans/Oversized Records

300 dpi effective resolution for original documents SMALLER than or EQUAL to 11"x17" or 187 sq. inches in size and 200 dpi effective resolution for original documents LARGER than 11"x17" or 187 sq. inches. Image size shall be the size of the original document at the scan resolution; examples: 8"x12" at 300 dpi or 16.5"x20.5" at 200 dpi.

The scanner or digital camera shall provide a true optical resolution of at least 300 dpi effective resolution for the original documents; interpolating to a higher resolution from a lower resolution scan shall not be permitted.

Resolution and Image Size- Photographs

Adjust scanning resolution to produce files with pixel arrays of 3000 pixels across the long image dimension by the proportional number of pixels for the specific photo format; for example, 3000 pixels by 2400 pixels for 8"x10" or 4"x5" prints or negatives, 3000 pixels by 2000 pixels for 35mm slides or negatives or 4"x6" prints. For square images, adjust the resolution to produce files with pixel arrays of 2700 pixels by 2700 pixels.

Final image size shall be set to a standard 10" across the long dimension at 300 dpi; examples: 8"x10" at 300 dpi for a 4"x5" negative or 6.7"x10" at 300 dpi for a 35mm slide. Square images shall be set to a standard 9"x9" at 300 dpi. The scanner or digital camera shall provide a true optical resolution of at least 3000 pixels across the long dimension of the image; interpolating to a higher resolution from a lower resolution scan shall not be permitted.

Resolution and Image Size: Graphic Records

Adjust scanning resolution to produce files with pixel arrays of 3000 pixels across. The long image dimension by the proportional number of pixels for original documents SMALLER than or EQUAL to 11"x17" or 187 sq. inches in size. Final image Size shall be set to a standard 10" across the long dimension at 300 dpi and square. Images shall be set to a standard 9"x9" at 300 dpi. 200 dpi effective resolution for original documents LARGER than 11"x17" or 187Sq. inches. Image size shall be the size of the original document at the scan resolution for example 16.5"x20.5" at 200 dpi.

The scanner or digital camera shall provide true optical resolution of at least 3000 lines or 300 dpi effective resolution for the original documents; interpolating to a higher. Resolution from a lower resolution scan shall not be permitted. Scanned text is a photograph of a printed page produced by a digital camera or scanner.

- Bitonal (1-bit black and white) images must be scanned at 300-600 ppi. Scanning at 600 ppi is recommended. This is appropriate for documents that consist

exclusively of clean printed type possessing high inherent contrast (e.g., laser printed or typeset on a white background).

- Gray scale (8-bit) must be scanned at 300-400 ppi. Scanning at 400 ppi is recommended. This is appropriate for textual documents of poor legibility because of low inherent contrast, staining, or fading (e.g., carbon copies, thermo-fax, documents with handwritten annotations or other markings), or that contain halftone illustrations or photographs.
- Colour (24-bit RGB) must be scanned at 300-400 ppi. Scanning at 400 ppi is recommended. Colour mode (if technically available) is appropriate for text containing colour information important to interpretation or content.

5.16 Process 11: Quality Assurance Procedures

A quality control program shall be initiated, documented, and maintained throughout all phases of the digital conversion. The quality control plan shall address all specifications and reporting requirements associated with each phase of the conversion project.

The unit/partner/contractor shall be responsible for performing all inspections or evaluations of the quality of all digital images during production to ensure the quality of the digital image's reports, the unit/partner/contractor shall document all quality control procedures and actions taken and the following specific reports shall be submitted.

5.16.1 Guidelines on quality assurance procedures

1. Quality Control Summary

The unit/partner/contractor shall provide a summary report of all quality control inspections performed for each batch of digital images produced. The report shall be submitted with digital files.

2. Inspection and Acceptance/Rejection of Digital Files

Electronic Access Project/Digital Imaging Project shall require one (1) to two (2) weeks to evaluate digital files, file name integrity, file header information, the accuracy of tracking data, and completeness of the before acceptance. Upon completion or receipt of a batch of digital

files, a survey and evaluation of a sampling of the digital images, including the master files, the access files, and the thumbnail files will be carried out. The overall quality of the digital images will be evaluated using the following procedures. At a minimum, 10 images or 10 % of each batch of digital images, whichever quantity is larger, shall be inspected for compliance with the digital imaging specifications and any one of the following defects:

- Image, is not the correct size
- Image not the correct resolution
- Incorrect file format
- Incorrect mode, a colour image is gray scale
- Incorrect bit depth
- Loss of detail in the highlights or shadows
- Uneven tonal values or flare
- Overall, too light or too dark
- Overall, too low or too high contrast
- Interference patterns (Newton's rings)
- Lack of sharpness
- Excessive sharpening, including unnatural appearance and halos around dark edges
- Improper image orientation, such as backward, up-side-down side-ways, etc.
- Excessive noise, usually noticeable in the darker portions of the image
- Misalignment of colour channels in RGB images
- Incomplete or cropped images
- excessively large border area

- Image not centred or skewed images
- Missing scan lines or dropped-out pixels
- Image processing and scanner artifacts, such as extraneous lines, noise, banding, etc.
- Dithering on master files or poor-quality dithering on access or thumbnail files
- Poor quality interpolation on small access files and thumbnail files
- Overall colour cast and inaccurate colour balance
- Improper file name
- Incomplete or incorrect header information

- The visual evaluation of the images shall be conducted while viewing the images at a 1-to-1 pixel
 - Ratio or 100% magnification on the monitor.
 - Testing Results and Acceptance/Rejection

If more than 1% of the total number of images in a batch, based on the randomly selected sampling, are found to be defective for any of the reasons listed above, the entire batch will be returned to the unit/partner/contractor for re-inspection of the batch and correction of the specific errors and any additional errors found by the unit/partner/contractor. If less than 1% of the batch is found to be defective, then only the specific defective images that are found shall be redone. The Electronic Access Project/Digital Imaging Project reserves the right to re-inspect the batch when it is resubmitted.

5.17 Process 12: Migration or uploading digitised records to the system

Hausman (2022) states that digital migration is the process of moving data from manual processes to a central computerized system that's automated and easily accessed remotely, such as cloud storage. This serves the purpose to ease access when you have a distributed workforce. It also involves any movement of your business processes from an analogue to a digital format through the following steps.

5.17.1 Guidelines for migration or uploading digitised records to the system

1. Begin by analysing your data and manual systems.

The first thing you must accomplish in preparation for digital migration is to analyze your data's scope and its complexity because undertaking a digital migration project can bring many unforeseen issues. Your approach at this stage determines how well the project progresses, whether it'll be flawless or full of setbacks and potential for data loss. Inspect and evaluate the data you want to migrate thoroughly. Know where it's stored, its current form or format, identify elements you must accomplish, and how data will look post-migration.

Secondly, evaluate the manual systems you have in place and conduct an audit of the processes used. Determine the workflows and what you need to improve or eliminate in the new system. An audit helps you know precisely where digitisation is required to improve these processes and specific areas where you should prioritize digital migration since the process of digitizing everything might involve significant time and effort.

These are some of the workflow audit areas that can help you figure out processes that benefit most from digital migration; any manual data entry processes, repetitive processes, a workflow that requires sharing between individuals or departments, work that goes through multiple stages and becomes difficult to trace or give a report on, any work that requires approval and signatures from multiple departments, work with manual computations, work that is prone to human error, any workflow that may require the assistance of remote staff.

2. Create an action plan and stick to it

Digital migration is a sensitive, yet the very intense process that requires a well-thought-out strategy to ensure that every step necessary ensures data accuracy and includes keys necessary when building relational databases. Careful planning helps reduce errors, data loss, and other adverse consequences such as migration failure. Ensure that all aspects and possible outcomes are adequately analyzed and contingency plans developed.

To ensure your digital migration process goes as you want, create a thorough action plan with scheduled timelines, areas of responsibility, and costs then stick to the plan. This is the key to

your digital transformation success since a plan helps you improve the chances of successfully transferring data. Create goals, requirements, and schedules for each phase of the migration.

Prioritize things such as backups to ensure that all your important information is salvageable in the case of a mishap. Planning also helps you to go over issues that may arise during the process soberly. You'll also have a thought-out contingency plan in case there's a setback. Below are some basic things to consider when creating a plan for digital migration.

3. Selection and assessment: You need to select and assess your digital system to check its capability and how it works. Check elements like user-friendliness, storage capacity, and technology, for example; can your system grow to match future needs and compatibility?

4. Create a migration map: After you selected a suitable system to suit your business needs, design a map for the entire process. Have a security plan, backups, different phases, and deadlines. Also, evaluate your budget to see if it can accommodate the whole process laid out.

5. Prepare data for the transfer: This is where you choose which data you require going forward, what's obsolete, and its format. Design relational databases that are forward-looking as it's awkward and cumbersome to add data you didn't plan for in the initial transfer. Ensure you backup everything before you start the transfer.

6. Test your transfer software: The purpose of this phase is to confirm that the data transfer tools you have can handle the task of successfully migrating your data to the system. Run a test using a small amount of your data then check the migration by comparing digitised data stored in a distributed network with the original data.

7. The migration process: Plan for the actual transfer of data to the new system.

Audit: Ensure your plan has an audit stage where you check data to ensure the migration successfully moved data to its new storage area like the system. A thorough check of random data is a much better tool than trying to do a less thorough check of a larger dataset.

It's essential to stick to your migration plan to keep you in line with what you set out to achieve. Without following a plan, things can quickly go astray.

8. Ensure utilisation of quality data migration software.

Digital migration is a lot of work if you decide to do it manually, although some of the initial processes are manual such as sorting, shredding, and scanning. However, for the transfer of data, consider using a data transfer tool that makes the process easier and promotes data integrity. Your choice of transfer tools must fit your budget and migration strategy. However, consider other factors rather than relying on the lowest prices. Here are some considerations when selecting your transfer software; functionality, ease of use, scalability, performance, security, cost, customer, and technical support from the vendor.

9. Communicate the digital migration process to staff.

Your staff members are a crucial part of the process and for the success of your business. It helps the process move more smoothly if you inform them of the intended digital migration and undertake staff training early in the process as they are the ones designated to use the systems eventually. Training reduces reluctance and increases compliance with new processes. Ensure your staff is ready to use the new systems when the whole migrating process is complete. Training staff early gives them enough time to adapt and catch up with the upgraded systems with ease. Training also reduces the need to replace existing employees who become frustrated with their inability or refusal to use the new system.

10. Create a digital migration framework.

One of the concerns that comes with digital migration is data security. Hackers get better and more sophisticated every year and the damage they cause is more serious. Ensuring your digital data is safe from cybercriminals saves the organization's reputation and data integrity. It's crucial to create a digital governance framework with clear guidelines and policies since your staffs represent the greatest vulnerability. The cloud services provider should similarly provide a secure platform with stringent authentication processes, access control, and identity management. This reduces the concern of data loss or theft.

If you are working with physical servers on location, the IT manager should ensure the site and databases are secure. Similarly, you need access control so that only authorized personnel can access the data and require frequent password updates. Also, control the ability of employees to copy data for use outside the facility by allowing secure remote access since a lost or stolen

thumb drive opens a huge security hole. Similarly, put operations in place to thoroughly erase data from discarded devices before disposal.

5.18 Process 13: Searching and retrieval of digitised records

Medical records retrieval varies depending on the storage system the medical records department will propose to use for their digitized medical records.

The medical records staff will follow the procedures for retrieval of digitized medical records based on how the system will operate.

5.18.1 Guidelines for searching and retrieval of paper-based medical records

Simon Fraser University, 2022 listed the procedures and requirements for retrieving records below;

- Check your departmental records to identify the files you need to retrieve in the system.
- Contact the medical records management to provide complete information about the files you wish to retrieve.
- Ensure that the files are returned to the medical records department when they are no longer needed by the user.

1. Identify the files you want to retrieve.

Using the file lists and organizations' location lists filed in the department; locate the name, title, and a number of the file to be retrieved. A unique identifying box number of the box or the file is contained in the organizations' shelf location number.

2. Contact records management to make your file retrieval request.

Initiate a retrieval request by contacting the medical records department clerk and providing the following information:

- Name and position title of the person making the request.
- Name of department.
- Room and telephone number.

- Archival box number.
- Medicals Records Department shelf location number.
- File name, title, and/or number.

Indicate if you will pick-up the item from the Medical Records department and Records Management Office or if you would like it delivered. Departments may request delivery service during the medical records officer shift or may pick records up during office hours. Set the time frame for regular file retrievals to be ready for pick-up or delivery as well as the maximum number of boxes that can be retrieved in one shift. A medical records centre file charge-out form with the retrieved files is created and kept safe so that they can be returned to the correct location. This form should indicate that the named person is responsible for the files and for returning them to the records management section.

3. Return files to storage

Once the requested materials are no longer required, they should be returned as soon as possible, by dropping them off at the medical records department and requesting the medical records officer to collect them. Confidential material should be returned via the right channels to the responsible authorities. Please return the file charge-out form with the material. The records management clerk will follow up regarding outstanding files that have not been returned.

5.19 Process 14: Distribution and sharing of digitised records

Digital distribution is the delivery or distribution of digital media content such as patients' records, staff records, administrative records, and other software. The term is generally used to describe distribution over an online delivery medium, such as the Internet, thus bypassing physical distribution methods, such as paper and optical discs. With the advancement of network bandwidth capabilities, online distribution became prominent in the 21st century.

5.19.1 Guidelines for distribution and sharing of digitised records

- Content distributed online may be streamed or downloaded, and often consists of medical records, personnel records, and administrative records which are only distributed or shared with authorized persons.
- Streaming involves downloading and using content at a user's request, or on-demand rather than allowing a user to store it permanently.
- In contrast, fully downloading content to a hard drive or other forms of storage media may allow offline access in the future.
- Specialist networks known as content delivery networks help distribute content over the Internet by ensuring both high availability and high performance.
- Alternative technologies for content delivery include peer-to-peer file sharing technologies.
- Sharing on website or content management systems.
- Sharing on shared drive/ e-filing system.
- Sharing on the intranet.
- Sharing using office 365 or share point.

CHAPTER SIX: SUMMARY OF THE FINDINGS, CONCLUSION, AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary, conclusions, and recommendations of the study. It concludes the findings and makes recommendations for addressing the challenges concerning the digitisation of manual medical records at ERRH (Medical Records department).

6.2 Summary of the findings

This section provides the summary of the research findings as important but is more focused on the key points, rather than on providing every specific finding. The summary of the finding of the study is discussed in this section based on the objectives of the study.

6.2.1 Types of medical records generated, received and kept at the hospital

The first objective of the study was to identify the different types of records generated, received, and kept at ERRH. The study discovered that the types of records managed at ERRH included; outpatient records, inpatient (ward) records, Personnel records, and administration records. Further, the study indicated that records at ERRH are created manually and also involve the use of an email management system, and the DHI2 system. In addition, the study further examined the formats of records managed at ERRH and they included paper-based formats like out-patient records, inpatient records, personnel files, and administration records and electronic which are generated by the staff, collected, and then entered into the system called DHIS2.

6.2.2 Finding out the criteria to be used in the selection of manual medical records for digitisation at ERRH

The second objective of the study was to find out the criteria to be used in the selection of manual medical records for digitisation at Entebbe Regional Referral Hospital and the summary of the findings includes the following. The study identified the criteria to be used in the selection of manual medical records for digitization as outlined below; content, value, handling and use,

demand, standards, durability, condition, the attribute of the documents, the acceptability of the resulting digital objects, and the finding aids

6.2.3 Examining the technologies and equipment to be used for digitising manual medical records at ERRH

The third object was to examine the technologies and equipment to be used for digitising manual medical records at ERRH (Medical records department) and the study findings on technologies and equipment to be used at ERRH medical records department include the following;

- ❖ Hardware (decision-making machines, computers, data storage, and data output peripherals)
- ❖ Software (image capturing and image editing)
- ❖ Network (data transmission), display, and printing technologies.
- ❖ Digital scanners, flatbed scanners, and sheet feed Scanners

The computers currently being used in the records section can be used as equipment when digitising manual medical records at ERRH. Computers can be important once the digitisation process has started at ERRH and can be used in accessioning, indexing, capturing metadata, and storage of manual medical records.

6.2.4 Examining the challenges faced during digitising at ERRH

The fourth objective was to examine the challenges faced when digitising and using manual medical records at ERRH medical records department the study findings on challenges during digitisation and when using manual medical records are as follows;

- ❖ Insufficient funding
- ❖ Wrong file format
- ❖ Lack of trained staff
- ❖ Lack of national standards and guidelines on digitisation
- ❖ Inadequate equipment

6.2.5 Guidelines to be used during digitisation

The last or fifth objective of the study was to develop guidelines for the digitisation of manual medical records. The study, therefore, discovered that the following are the guidelines.

- For document preparation, the condition of the materials has to first be assessed to determine whether they can withstand the physical handling involved in digitisation for example special handling of fragile or damaged records. Other issues such as removing papers from bindings such as staples, file clips, or paper clips will be considered.,
- Handling other formats. Other formats, for example, enclosures on files containing objects such as x-ray records, ward registers, audio, and videos have to be handled differently.
- Partially digitising patient records, with the current effects of COVID-19, partial digitization of the patient records. Partial digitisation options might include: Chronological digitising from a certain date, digitizing only certain formats such as all bound registers, and digitizing only key documents.
- Technical specifications; issues to consider are file formats, resolution, type of image colour resolution or bit depth, and colour management. This is because patient records are for long-term preservation.
- Security during and after digitisation, security measures such as the purchase of CCTV cameras, alarm locks, and security training of the staff have to be undertaken.
- Storage of record and backup, a system to be developed for the storage backup of records as well as backing up on the cloud.

6.3 Conclusion from the findings

The study concluded that the development and implementation of the guidelines for digitisation would streamline the whole process of digitisation of manual medical records at the medical records department. It will also guide all staff during the execution of digitisation activities. Therefore, it should be put into consideration by the Administration.

The study also examined the challenges encountered by the department in the digitisation of medical records and concluded by suggesting, that they can all be solved only if all the staff in the records

department, employees, and administration adhere to the recommendations made by the research team

6.4 Recommendations

The study recommended that the medical records department should;

Adapt to the developed digitisation guideline manual to streamline the procedures followed while digitising medical records and also ensure efficient and effective service delivery to the users.

Recruit more qualified records staff i.e., with a minimum of a degree in records and archives management or Library and Information science as they will be able to handle the rising volume of medical records at the department and also add capacity to the department.

Provide adequate training to its staff or allow them to go for refresher courses in the disposal of records. It will help them equip themselves with new knowledge and also to ensure the effectiveness of the proposed disposal procedures.

Update the records Management policy by including digitisation guidelines, and should set up strict penalties for those who violate them.

Purchase more digitisation equipment such as computers, scanners, photocopiers, etc. to overcome the challenge of inadequate digitisation equipment for medical records.

Allocate more funds to purchase enough quality equipment for use in the digitisation of medical records

Designate a digitisation unit specifically to handle the digitisation of medical records.

Employ more experienced records personnel to increase the human resource in the department, this will reduce work overload.

6.5 Area of Further Study

The study recommends further research in areas such as;

- Electronic Systems are used in the digitisation of medical records.
- Digital transfer of medical records to archives.
- Security management for digital medical records.

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APPENDICES

Appendix A: Gantt chart for Research Activities

MONTH	WEEK NO.	TASK	ASSIGN TO	MON	TUE	WED	THUR	FRI	SAT	SUN	PROGRESS
JUNE	WEEK1	Assignment of group	COORDINATOR								
	WEEK2	Assigning of supervisor	COORDINATOR								
	WEEK3	Topic generation and approval	COORDINATOR								
	WEEK4	Proposal writing and research	GROUP M								
	WEEK1	Proposal writing and research	GROUP M								
	WEEK2	Proposal writing and research	GROUP M								
	WEEK3	Proposal writing and research	GROUP M								
		Approval of proposal, getting an introductory									

		collection tools.											
AUG	WEEK1	Data collection	GROUP M										
	WEEK2	Data collection	GROUP M										
	WEEK3	Data collection	GROUP M										
	WEEK4	Analysis of data	GROUP M										
SEPT	WEEK1	Analysis of data	GROUP M										
	WEEK2	Compiling of the final report	GROUP M										
	WEEK3	Compiling of the final report	GROUP M										
	WEEK4	Editing the final report	GROUP M										
OCT	WEEK1	Proof reading the final report											
	WEEK2	Submission of the final report for approval											
	WEEK3	Approval of the final report	SUPERVISOR, H.O.D										
	WEEK4	Submission to University Library repository to clear for graduation											

Appendix B: Interview guide

Interview guide

Dear respondent,

We are from the College of Computing and Information Sciences (COCIS), East African School of Library & Information Science (EASLIS) - Makerere University pursuing a bachelor's of records and archives management. We are carrying out a research project on the topic: Developing guidelines for the digitisation of manual medical records: A Case Study of Entebbe Regional Referral Hospital. We would like to ask you some questions that are relevant to our research and we kindly request your answers and active participation, the information obtained is to be treated with the utmost confidentiality and only used for research purposes.

SECTION A. BACKGROUND INFORMATION

1. Gender

Male Female

2. Education

level

Certificate

Diploma

Bachelors

Masters

3. Age bracket

20-30

years 31-

40 years

41-50

years

50 years and above

4. Position

.....

5. For how long have you worked in the hospital?

.....

SECTION B.

Objective one: To find out the type of medical records generated and received at Entebbe Regional Referral Hospital.

1. What are the types of medical records generated, received, and kept in the hospital, especially the Medical Records department?
2. In which format are medical records kept?
3. Does Entebbe Regional Referral Hospital have a registry?
4. If yes, how many?

Objective Two: To find out the criteria used in the selection of records to be digitised at Entebbe Regional Referral Hospital.

1. What criteria should be followed in the selection of manual medical records for digitisation in your department?
2. What types of medical records should be selected for digitisation?

Objective Three: Examine the technologies and equipment used during the digitisation of manual medical records at Entebbe Regional Referral Hospital.

1. What are the equipment and technologies to be used for digitising manual medical records in your department?
2. How should digitisation equipment be used and maintained?

Objective four: Examine the challenges faced in the digitisation process of manual medical records at Entebbe Regional Referral Hospital.

1. What are the challenges faced in medical records management?
2. What measures have been taken to overcome the problems mentioned above?

Objective Five: Develop guidelines for digitising manual medical records at Entebbe Regional Referral Hospital.

1. Does the medical records department have a medical records management policy and manuals?
2. If yes, how effective is it?
3. In which format should the guidelines be designed for the medical records department and why?
4. What should be considered and included in digitisation guidelines for medical records?
5. How should these guidelines be?

Thank you so much for your time and active participation.

Appendix C: Observation guide

Observation Guide

An observation guide for developing guidelines for the digitisation of records at Entebbe regional referral hospital.

Objectives	Observations
<p>1.To find out the type of medical records generated, received, and kept at Entebbe Regional Referral Hospital.</p>	<p>1.The type of records in the records department.</p> <p>.....</p> <p>.....</p> <p>2.Formats of records kept</p> <p>.....</p>

<p>2. To find out the criteria to be used in the selection of medical records for digitisation at Entebbe Regional Referral Hospital.</p>	<p>1.Type of records selected </p> <p>2. How do the staff select medical records </p>
<p>3. To examine the technologies and equipment to be used for digitising manual medical records at Entebbe Regional Referral Hospital.</p>	<p>1. Digitisation equipment and technologies to be used. </p> <p>2. The usage of the equipment and technologies. </p> <p>3.Condition of the equipment </p>
<p>4. To examine the challenges faced when using manual medical records at Entebbe Regional Referral Hospital.</p>	<p>1. The condition of manual medical records </p> <p>2. Medical records security</p>

	<p>.....</p>
<p>5.To develop guidelines for digitising manual medical records at Entebbe Regional Referral Hospital.</p>	<ol style="list-style-type: none"> <li data-bbox="836 367 1409 577">1. Medicalrecordsdigitisation policies <li data-bbox="836 619 1409 745">2. Medical Record keeping policy <li data-bbox="836 787 1409 913">3. Existing manuals and guidelines

Appendix D: Introductory letter

MAKERERE

P.O.Box 7062 Kampala Uganda
Email: info@cis.mak.ac.ug
URL: http://www.cis.mak.ac.ug



UNIVERSITY

Tel: +256-392-000-180
Fax: +256-414 540 620
twitter: @cocismak
facebook: makcocis

**COLLEGE OF COMPUTING & INFORMATION SCIENCES
EAST AFRICAN SCHOOL OF LIBRARY AND INFORMATION SCIENCE (EASLIS)**

September 16, 2022

Office of the Director,
The Human Resource Manager
Entebbe Regional Referral Hospital
P. O. Box 29
Kampala – Uganda

Approved
Rose Masekela



Dear Sir/ Madam,

RE: INTRODUCTION LETTER

This is to introduce to you the following students pursuing a Bachelor's Degree in Records and Archives Management (BRAM Year III) at the East African School of Library and Information Science under the College of Computing & Information Sciences, Makerere University.

- | | |
|--------------------------------------|------------|
| 1. Akello Rose Grace | 19/U/28717 |
| 2. Kamukama Denise Patience | 19/U/29204 |
| 3. Namalwa Katsi Esther <i>katsi</i> | 19/U/28758 |
| 4. Awekonimungu Specioza | 19/U/29139 |

Approved
Head of Records
is assnt accordingly
Dr. Chino Nkefu

As part of their degree program, they are entitled to carry out research under the course BRM 3204. The title of their research is "Developing Guidelines for the Digitization of Manual Medical Records for Entebbe Regional Referral Hospital".

The purpose of this communication is to request you to offer them the necessary assistance required.

22/09/2022

Please note that all the information obtained shall be used for academic purposes only.

Sincerely,



Dr. David Luyombya
**HEAD OF DEPARTMENT
RECORDS AND ARCHIVES MANAGEMENT**

CC
- File copy
- Head of...