Electronic Health Records

Manual for Developing Countries

World Health Organization
Western Pacific Region

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A Manual for Developing Countries

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CONTENTS

Electronic Health Records: INTRODUCTION

Basic Concepts

This manual has been designed as a basic reference for use when exploring the development and implementation of Electronic Health Record (EHR) systems. It provides a general overview, some basic definitions and examples of EHR practices. Also covered are points for consideration when moving towards the introduction of an EHR, some issues and challenges which may need to be addressed and some possible strategies, along with steps and activities to implementation. There is a particular focus on setting goals, revising policies, developing an action plan and outlining implementation procedures.

Electronic health records are a complex issue and the following information is presented in a simple, concise and straight-to-the-point fashion, intended as an introductory reference for the topic. For those who want more detailed information there is a wealth of literature available if they wish to read more deeply on the subject. A Medline search was conducted and a short annotated bibliography has been included.

Target Users of the Manual

This manual has been designed with the following persons in mind:

- Ministry of Health staff at national and provincial or district health centre levels actively involved in exploring the development of electronic health records.

- People who do not have an in-depth knowledge of EHR and who need a general overview, particularly if they are members of a multi-disciplinary committee tasked with investigating the introduction of an EHR.

- Health record managers/administrators who are responsible for the medical/health record and record services at primary and secondary levels of care in developing countries.

Using the Manual

It is important that the reader treats this manual not as a set of definitive rules applicable in every situation, as each institution/country have different needs and requirements, but as a guide to help ensure that some important

activities and issues have been considered and addressed before proceeding with the task of developing and implementing an EHR.

The Structure

The text has been divided into six chapters. The first chapter deals with a general overview, basic EHR definitions and some examples of EHR practices. Chapter 2 covers some preliminary steps required prior to developing a plan for implementation. Chapter 3 covers issues and challenges which need to be identified and addressed. Chapter 4 deals with planning for the introduction of an EHR and includes perceived benefits, setting goals, developing strategies and preparing policies and procedures. Chapter 5 covers factors to be considered when developing an implementation plan and Chapter 6 deals with implementation. The above chapters are followed by an annotated bibliography and a glossary of terms.

CHAPTER 1 General Overview

With the many advances in information technology over the past 20 years, particularly in healthcare, a number of different forms of electronic health records (EHR) have been discussed, developed, and implemented. Some institutions/countries are currently planning the introduction of a nationwide electronic health record while others have actually implemented some form of EHR. However, the type and extent of electronic health records vary and what one country calls an EHR may not be the same as that developed in another country. Although work has been undertaken by institutions/countries on some form of a computerised patient healthcare information system, as yet not many hospitals have successfully introduced an electronic health record with clinical data entry at the point of care.

Although interest in automating the health record is generally high in both developed and developing countries unfortunately, in some cases, the introduction of an EHR system seems overwhelming and almost out of reach to many healthcare providers and administrators as well as medical record/ health information managers. Why is this so? The obstacles may not be available technology but technical support and the cost of changing to an electronic system coupled with insufficient healthcare funding. In many developing countries costs, available technology, lack of technical expertise and computer skills of staff, and lack of data processing facilities are in fact major issues which would need to be addressed before implementation is possible.

In addition to the above, resistance by some medical practitioners and health professionals generally to a change from manual to electronic documentation may be a problem in both developed and developing countries. Most health administrators and information managers are aware that it may take time to change or at least modify health practitioner behaviour and attitudes.

The reason for wanting to change to an electronic system is important. Many persons involved in healthcare today expect to move from a paper to a paperless environment. This is a major step and has only been successfully achieved in a few healthcare institutions to date. Institutions should not focus on just going paperless. They should focus on encouraging departments and healthcare practitioners to move to an electronic system to:

- Improve the accuracy and quality of data recorded in a health record
- Enhance healthcare practitioners' access to a patient's healthcare information enabling it to be shared by all for the present and continuing care of that patient

- Improve the quality of care as a result of having health information immediately available at all times for patient care
- Improve the efficiency of the health record service
- Contain healthcare costs

A paperless environment will come.

Also in some instances there is a tendency to expect that with the introduction of an electronic health record many of the problems currently experienced in maintaining paper health records will be eliminated. This is not the case.

An electronic health record is not a simple replacement of the paper record.

If identified problems are not addressed and remedied prior to introducing an EHR system merely automating health record content and procedures may perpetuate deficiencies and not meet the EHR goals of the institution/country.

Current problems identified in healthcare documentation, as well as privacy and confidentiality issues must be addressed and quality control measures introduced before a successful change can be implemented.

Although the introduction of a fully electronic health record system may seem far off in many healthcare institutions/countries they are being introduced rapidly in others and there is no doubt that the future of health information management lies with automation and the automatic transmission of information required for patient management at all levels of healthcare.

Defining an Electronic Health Record

As mentioned above when people refer to what they have been using as an electronic health record, it may not be the same as other electronic health records developed in different institutions/countries. This may be confusing. In some cases it may be a longitudinal record widely available across a number of institutions but in others in may be a limited automated system only available within a confined community or within a specific unit or department. It is important, therefore, to know what definitions are being used and determine the type and extent of electronic health record system your institution/country wishes to implement.

Over the years a number of terms have been used to describe the move from a manual or paper record to one generated electronically in one form or another. Some of the better known terms include: Automated Health

Records (AHR), Electronic Medical Record (EMR), Computer-based Patient Record (CPR), and Electronic Health Record (EHR).

- **Automated Health Records (AHR)**

The term Automated Health Records has been used to describe a collection of computer-stored images of traditional health record documents. Typically, these documents are scanned into a computer and the images are stored on optical disks.

Most of the focus in the early 1990's was on document scanning onto optical disks. This addressed access, space, and control problems related to paper based records but did not address data input/output at patient care level.

- **Electronic Medical Record (EMR)**

The term Electronic Medical Record or EMR, as with Automated Health Records, has been used to describe automated systems based on document imaging or systems which have been developed within a medical practice or community health centre. These have been used extensively by general practitioners in many developed countries and include patient identification details, medications and prescription generation, laboratory results and in some cases all healthcare information recorded by the doctor during each visit by the patient. In some countries, such as Korea, the term EMR is used to define an electronic record system within a hospital which as well as the above includes clinical information entered by the healthcare professional at the point of care.

- **Computer-based Patient Record (CPR)**

In the USA the term Computer-based Patient Record (CPR) was introduced in the 1990's. This was defined as a collection of health information for one patient linked by a patient identifier. The CPR could include as little as a single episode of care for a patient or healthcare information over an extended period of time (Amatayakul, 2004).

Early CPR's focused on functions such as medical alerts, medication orders, providing integrated data on a patient's registration, admission, and financial details, and recording information from nurses, laboratory, radiology, and pharmacy. Although this form of a computer-based patient record was implemented in a variety of settings the focus on exchanging health information was limited to inpatient facilities.

- **Electronic Health Record (EHR)**

The term Electronic Health Record is widely used in many countries with variation in definitions and the extent of coverage. In today's environment it is generally accepted as a longitudinal health record with entries by healthcare

practitioners in multiple sites where care is provided. In the USA the current definition of an EHR is:

> The electronic health record includes all information contained in a traditional health record including a patient's health profile, behavioural and environmental information. As well as content the EHR also includes the dimension of time, which allows for the inclusion of information across multiple episodes and providers, which will ultimately evolve into a lifetime record (Mon, 2004, Amatayakul, 2004).

More simply stated, this type of a longitudinal electronic health record could be defined as:

The Electronic Health Record:

- **Contains all personal health information belonging to an individual;**
- **Is entered and accessed electronically by healthcare providers over the person's lifetime; and**
- **Extends beyond acute inpatient situations including all ambulatory care settings at which the patient receives care.**

The World Health Organization's declaration of Health for All by the Year 2000 highlighted the need for better healthcare services, not only at the hospital (secondary) level, but also for primary healthcare and community health services. This has required a change of focus in healthcare in many areas to ensure, if possible, that the implementation of an electronic health record covers healthcare delivery services across a broad spectrum of healthcare.

The USA, UK, Australia and some European countries have adopted this concept promoting the development of a longitudinal electronic health record aimed at improving the delivery of healthcare and ensuring that care given to an individual by various healthcare practitioners from many different settings in their lifetime is maintained in a single record and readily available. This is considered by many to be the ideal situation.

This type of system would require a computer program that captures data at the time and place where healthcare is provided, whether at a hospital or primary care level over an extended period of time. It would enable healthcare information, such as a person's allergies, recent test results or prescribing history to be readily available at all times to assist with decisions on diagnoses, treatment and medication at all levels of healthcare.

Ideally it should reflect the entire health history of an individual across his or her lifetime including data from multiple providers from a variety of healthcare settings.

Such an extensive system, however, has not been introduced by many institutions/countries to date, although many are planned, but may still not be possible in some developing countries or in fact some developed countries.

The ideal situation is not always possible and healthcare administrators need to identify how they can proceed to automation with available resources both technical and human.

Given the situation in your institution/country would a longitudinal electronic health record be feasible? Or would the institution be looking at a simpler approach? For example:

The proposed electronic health record will:

- **Contain all personal health information of an individual patient, from the patient's first admission or attendance at the hospital;**
- **Be entered electronically by healthcare providers at the point of care over the patient's lifetime;**
- **Have information readily available and accessed by all healthcare providers attending to the patient.**

Whatever the type of electronic health record decided upon the health information contained in it must be organized primarily to support continuing, efficient, and quality healthcare. It must also continue to meet legal, confidentiality, and retention requirements of the patient, the attending health professional and the healthcare institution/country.

For the purpose of this manual, the title electronic health record (EHR), as defined immediately above, will be used as the preferred definition.

Examples of EHR Practices

Implementation of some form of electronic health record has been achieved in a number of countries over recent years. Examples of a few EHR practices are as follows:

- In Malaysia two hospitals have already gone paperless. A 960-bed hospital was the first and a 270-bed hospital, the second. One primary healthcare facility also has an electronic health record and does not maintain a paper record. In addition, in 1985 a Teaching Hospital in Kuala Lumpur developed a Health Information Management Administration System (HIMAS) using an IBM mainframe computer covering patient admission, transfer, and separation (ATS), appointment scheduling and a medical records tracing system.

  The present INFOMED system being used now at the hospital is

an upgraded version of HIMAS which includes the ATS, patient scheduling, and medical records tracking applications, pharmacy ordering, laboratory ordering/reporting, radiological ordering and reporting, patient accounting and a small system on case-mix. All the systems are not fully integrated, but the hospital started a new Health Information System (HIS) in 2004 aimed at upgrading INFOMED to integrate the present systems and add more systems complete with e-records. The hospital administration started the implementation of HIS in phases in 2004 and plan for completion within seven years.

- In Korea 11 hospitals have implemented a fully Electronic Medical Record (EMR). They include all inpatient and outpatient healthcare information. Broken down by bed size, one with the bed capacity of 300-399, two with the bed capacity of 500-599, two with the bed capacity of 600-699, and six with a bed capacity of over 700. In addition, there are three hospitals with over 500 beds with an EMR implemented for inpatients only, and two hospitals with over 700 beds with an EMR for outpatients only. Another three hospitals have partially implemented an EMR system.

  In one of the major hospitals the EMR was introduced in October 2004 for both inpatients and outpatients. Most of the old medical records have been scanned and very recent ones are currently being scanned with the hospital hoping to complete them by the end of 2005.

  For inpatients, data is entered at the bedside using a notebook computer. For outpatients, doctors input data at the point of care via computer terminals, but if they are too busy, physician's assistants enter data for them. The language being used for the EMR is SNOMED CT. Signed consent forms for treatment are scanned immediately after discharge and connected to the EMR as are letters from referring practitioners and hospitals. Some test reports which are produced from equipment not yet interfaced to the EMR are also scanned immediately after discharge enabling users to view them via a monitor. This equipment is to be interfaced as soon as possible.

  A goal of the hospital is to share information with all the national hospitals and public healthcare facilities but at present they can only share data with one branch of the hospital.

- An EHR standard is being developed in Indonesia and is mainly concerned with the hospital-based environment even though some data may also come from community healthcare sectors. In an area in the middle of Java, there is a district that has already linked the reporting and recording of several primary healthcare centers into their computer system (using a Local Area Network, approaching to WAN). The health workers are now able to determine how many TB patients are being treated as well as a number of other diseases treated in their area. This area has been chosen to be the centre of training for primary healthcare facilities. Most hospitals, however still use traditional non-EH records although progress is being made in developing an EHR policy and standards.

- In China, a number of hospitals have successfully introduced some form of electronic health record but as yet, as far as can be ascertained, none have been able to go paperless. The concept of a longitudinal electronic health record is envisaged by the Chinese Health Ministry but problems have arisen because some institutions are unable to share data due to the incompatibility of their systems. This is an extremely important issue and compatibility with other systems with which the proposed system needs to interface with is an important consideration before the introduction of an EHR.

Nationwide electronic health records are still limited but progress is being made in a number of instances such as:

- The Australian Government is funding the implementation of a national health information network, called HealthConnect – a proposed network aimed at improving the flow of information across the Australian health sector (HealthConnect 2000). It is a system involving the electronic collection, storage and exchange of patient health information via a secure network and within privacy safeguards. The HealthConnect objective aims at improving the overall delivery and efficiency of healthcare, achieve better quality care and patient satisfaction. Under this system health related information about a person would be documented in a standard electronic format at the point-of-care, such as at a hospital or a general practitioner's office. The information could then be retrieved online whenever it was needed and exchanged, with the patient's consent, between authorized healthcare professionals. Across Australia a number of initiatives based on HealthConnect are already in place with more being developed and implemented.

Other countries such as Singapore, Taiwan, Hong Kong and Thailand are also developing electronic health records in one form or another with successful implementation.

There is no question that electronic health records are here to stay. The extent and type of automation, however, will differ considerably not only between countries but between institutions within a country.

The introduction of an EHR can be a mammoth undertaking. Some administrators and medical practitioners may still be hesitant about such a major step but with clearly determined goals as to the type and extent of the system required and well prepared plans for implementation, the introduction of an EHR should go smoothly. There may be some teething problems and some people may not be supportive at first but as the benefits become visible its value will become apparent. Once fully up and running it should be as accepted as mobile phones and e-mail facilities are in the current environment.

It is important to remember that the introduction of any form of electronic health record must have complete backing and support of the administration, medical and nursing staff, and clerical personnel. It is also important to remember that:

Whether a manual or electronic health record is maintained there is still the need to ensure that the information generated by healthcare providers is accurate, timely, and available when needed.

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CHAPTER 2 Preliminary Steps

When considering a move from a manual medical record system to some form of electronic health record the major question is: Where to begin?

The Executive Committee charged with investigating the introduction of an electronic health record system should take some preliminary steps.

Firstly, if they feel they do not have an adequate technical background to make the right decisions on an EHR system they should consider employing a consultant. If possible the consultant should have a strong background in health information management, health informatics and electronic health record implementation. Just having an information technology (IT) background is not sufficient. They need to understand the health record environment and how manual health records are maintained as well as electronic health record systems. They also need to have some knowledge of systems operating in developing countries and any restrictions that may affect EHR implementation, such as lack of funds, lack of technical support, unreliable supply of electricity, and lack of trained staff. This may seem difficult but there are persons currently working in health record management in a number of countries, both developed and developing who could be recruited.

The next step would be to review the existing medical record system to assess the quality of current records and medical record services, identify problems and prepare a formal report summarizing results. Such a review would be extremely useful when assessing the type of system to be selected and the possible benefits of moving to an electronic health record.

Review of Current Health Record System

When reviewing current medical record services the first questions to be asked are:

- **Are medical records currently kept on all patients - inpatients, outpatients and accident and emergency (A & E) patients?**

  The answer to this question should be "yes" and is the case in most institutions. Some may not keep A & E records and do not wish to include them. However, it should be remembered that A & E records are often used in medico-legal cases and may contain the first information available about a patient's health or an injury and are very important.

- **What type of medical record is kept? Is the medical record system centralised using a unit numbering system? That is, are**

all admissions, outpatient notes and accident and emergency records filed under one number in the one medical record?

If this is the case the transition from a manual system to an electronic system will be easier. If, in fact, a patient has more than one record – that is, numerous medical records scattered throughout the file, this is **NOT** good medical record practice and should be changed.

This may be the situation in some developing countries where a serial number is used with patients receiving a new number and new record each time they attend the hospital. In some countries it is used to enable the collection of statistics **which is not necessary and bad practice.** Some institutions issue a new number for each admission but file all admissions in the one folder.

It is not good practice to issue a new hospital number each time the patient attends. In a manual record system or an electronic one patients should be issued with a number on the first attendance and retain that number for all future admissions and attendances.

If inpatient and outpatient, including A & E, medical records are kept separately, it may mean that the institution will either need to start with automating the inpatient medical record first and when running smoothly incorporate the outpatient attendances or alternatively consider combining both at the time of implementation. The latter, however, could be a major undertaking and would require careful planning.

The next important questions relate to **patient identification.** This is a key issue in health information management as it is vital that each patient is uniquely identified, not only when considering automation but also in all manual systems:

- **How are patients identified? Do all persons have a national identification number? Is this used to uniquely identify the patient? If a national identification number is not issued what information is used to identify each patient?**

  Ideally, to identify a person when a national identification number is not used institutions need to determine what piece of information is not likely to be changed. Names and addresses should not be used as they can be readily changed. Date of Birth could be used but it has been found that many people as they age cannot remember their birth date accurately. Some countries use:

  - The patient's mother's maiden name – this has proven the most useful as it does not change but there may be exceptions as some patient's may not know their mother's maiden name;

- Father's first name – again some patient's may not know their father's first name;

- Biometric characteristics such as a fingerprint or footprint have been used for identification;

- A personal national insurance number or social security number – there may also be problems associated with both these as all persons may not have a personal national insurance number or a social security number.

Therefore some form of national identification number is considered the best way of uniquely identifying individual patients.

It is important to note that a unique patient identification number is not the same as a hospital/medical record number. It is the means of uniquely identifying an individual – once identified, a hospital or medical record number is usually issued to enable all information on an individual patient to be filed and maintained within the one medical record.

- **Does the institution have a Patient Master Index (PMI)? Is it computerised?**

The PMI is an index of all patients who have attended the hospital as an inpatient, outpatient or accident or emergency patient. It is essential to be able to identify an individual medical record and if the institution does not have one steps need to be taken as soon as possible to introduce a PMI.

The PMI should only contain identifying and demographic information to be able to identify a patient's medical/health record. It would include the patient's full name, hospital medical record number, address, date of birth and age, national ID number (if any) or other piece of information that will help to uniquely identify that patient.

A problem which may need to be addressed prior to implementing an EHR is the lack of training of clerical staff on the need to carefully question each patient or relative to ensure that they can uniquely identify the patient. Incorrect spelling of names can be a problem if clerical staff is not properly trained.

A well designed electronic health record is dependent on the patient being correctly identified and all information for that patient maintained in the one record within the system.

- **Are medical records well documented? What is the quality of the medical record?**
    - **Has all essential information been recorded, are all entries signed and dated?**
    - **Are quality checks performed on current paper records? If so, have any documentation problems been identified?**

One of the major problems over the years in many institutions/countries has been inadequate medical record documentation. Problems include incomplete, insufficient or poor documentation and non-use of standard terminology.

A move to an electronic health record will not be successful if documentation deficiencies are not addressed and healthcare practitioners educated in good healthcare documentation. Health practitioners should also be encouraged to enter all relevant data at the point of care at the time that care is given.

- **Are daily admissions and discharge lists produced?**

This is a major concern in a manual system because if the MRD does not receive a list of discharges and deaths each day, it is impossible to know whether they have received all the medical records of discharged patients.

The lack of a discharge list could have a detrimental effect on the monthly morbidity statistics as staff may not be able to account for all discharged or deceased patients.

An advantage of an electronic system would be that both an admission and a discharge list should be automatically generated as would the daily bed census.

- **Does the MRD receive loose forms after patients have been discharged?**

This is a major issue particularly if it is an important x-ray or laboratory report. Loose forms are often returned to the MRD from wards and clinics days or weeks after the patient has been discharged or died and need to be placed in the correct medical record. This is often extremely difficult as in many cases loose sheets do not contain the MRN and/or the patient's name.

If this has been and still is a problem the introduction of an EHR should ensure that identifying information is automatically entered

in all sections of the patient's health record and the problem of loose sheets or missing data should be eliminated.

Other questions and issues include:

- **Are inpatient morbidity statistics collected and compiled by medical record staff?**

  Are they responsible for the submission of monthly returns and the annual report of hospital activity? What about Outpatient statistics? Are there any problems with the collection and are they produced within the anticipated time frame?

  Computerisation has had a marked effect on the production of morbidity statistics but if the original information is not correct the statistics will not be accurate even with automation.

- **Are medical records returned to the medical record department on discharge of the patient?**

  If they are returned promptly have they been completed or are they usually incomplete and without a discharge summary?

  How should staff handle incomplete medical records?

  A major problem in many institutions is incomplete medical records. This is compounded when medical records are not returned to the MRD promptly.

  The introduction of an EHR system is seen by many as a way of improving this situation but may not always be the case if health practitioners are not trained or re-trained to complete medical/health records on the ward at the time of discharge. With the introduction of an EHR system the doctor should be able to complete the health record via a computer terminal in the ward.

- **How are medical records filed?**

  Are medical records filed by the medical record/hospital number? What system of filing is used?

  Medical record filing is often a major problem. If there is insufficient space to accurately file medical records it is difficult for staff to file and retrieve medical records efficiently and often leads to misfiled or missing records. Overcrowded shelves compound the problem of misfiling or misplacing medical records.

  Many institutions see filing space as a major problem and look forward to computerisation as a solution.

- **Is there a problem with duplicate medical records?**

  If the patient's medical record cannot be found, although he or she has attended the hospital previously, should staff prepare a new or duplicate medical record?

  In this instance, a duplicate medical record needs to be prepared but must be clearly labelled "duplicate" and combined with the old records when they are located. With computerisation this problem should be eliminated as long as each patient is accurately identified at all times.

- **How is information released for medico-legal purposes?**

  The reviewer should determine how staff should handle requests for information for workers compensation cases, and medico-legal requests from insurance companies and lawyers.

  Is the information readily accessible and available?

  Is there a delay experienced in the completion of the reports by medical staff?

  If medico-legal insurance and workers compensation reports are not completed accurately and promptly, the patient could be affected as could the hospital in litigation cases.

  With an electronic health record, such reports should be able to be generated automatically by medical staff as long as medical record documentation is completed accurately and at the time care is given.

- **When the medical record has been completed by the doctor do medical record staff code the main condition using a classification system such as ICD 10?**

  Do they code procedures? Are coders trained in coding using ICD 10?

  Are the codes indexed to enable the retrieval of medical records for research, health statistics and epidemiological studies?

  The accurate classification of diseases treated and procedures performed is a major part of the work of the health record services. In many cases, it is not performed accurately or in a timely fashion.

  Some of the problems are caused by **poorly documented and incomplete medical records, lack of standard terminology,**

and untrained or poorly trained coding staff.

Computer-assisted coding has been introduced by many institutions but staff still need to be well trained in coding and health records need to be accurate and complete.

With an electronic system problems with documentation and standard terminology should be eliminated as long as standard terminology is imbedded in the system.

- **Do outpatient staff complete Outpatient Morbidity statistics?**

  Are outpatient's clinical conditions coded using the ICD-10 or the International Classification of Primary Care (ICPC-2)?

  This does **now** occur in many hospitals and returns are sent to the Medical Records Department for the completion of monthly statistics. Some institutions however do code outpatient attendances electronically which is seen as a **possible** benefit.

The reviewers also need to identify IT systems currently in place that could constitute the early stages of the planned EHR. Does the institution already have any of the following?•

- o A Computerised Patient Master Index (PMI)
- o A Computerised Patient Administration System (PAS) – this would cover admissions, transfers and discharges/separations
- o Automated pathology and radiology reporting system
- o Electronically generated discharge summaries
- o Computer-assisted coding and indexing
- o Computer generated healthcare statistics – both morbidity and mortality
- o A computerised medical record tracking system

At the completion of the review the Executive should now be able to determine any problems requiring attention before they can progress to automation. It should also give them an idea as to what benefits they could anticipate if they progress toward EHR implementation. The final question therefore should be:

- **What are the areas that need immediate attention before a successful EHR system could be introduced? Important items include:**
  - o All patients should have one medical record: Is this the case?

- All patients should be uniquely identified: Is this the case? Any problems associated with patient identification should be solved as soon as possible.

- A PMI is maintained: Is this the case? If not, it should also be introduced as soon as possible.

- Health practitioners complete the medical records by documenting patient care information at the point and time of care using standard terminology: Is this the case?

As mentioned previously, inadequate medical record documentation has been, and still is in many institutions, a major problem in healthcare. If the review team found problems in medical record documentation, they need to look at ways and means of encouraging health practitioners to improve their documentation practices before introducing an EHR. Computerisation will **NOT** change poor documentation unless health practitioners are educated or re-educated with regard to best practice in health record documentation.

Review of Policies Relating to Medical Records Practice

The Executive should also review the existing policies relating to medical record practice to identify areas which will require updating to cover electronic health records.

For example questions relating to some policies currently in place may include:

- Does the facility have a record retention policy? If so, is it being applied? Will it require revision?

- Does the facility have a policy on the release of information from personal health records? Does it need revision?

- What is the policy on patient access to their healthcare information? If there is no policy is it envisaged that patients will have access to their health information in the future?

Following a full review of the existing medical record system the Executive should be able to consider the type of electronic health record the institution/ country could be looking at, that is:

- What the proposed system would cover and what restrictions need to be addressed before moving forward?

Do they see the possibility of a fully electronic record that will:

- Automatically collect clinical, administrative and financial data at the point of contact with a patient;

- Readily exchange data between health professionals to facilitate continuing care;

- Measure improvement in the health of individuals as well as measure healthcare outcomes within the community/country;

- Maintain privacy, confidentiality and security of health information;

- Facilitate research and assist with teaching healthcare professionals;

- Provide timely statistical data, in an efficient manner, to public health and government ministries (such reporting of health data is important in the detection and monitoring of disease outbreaks, as well as providing meaningful and accurate statistics to measure the health status of the population); and

- Support management in administrative and financial reporting and other processes (Mon, 2004).

If the Executive has decided that the institution/country should move forward on the possible introduction of an electronic health record they should, if possible, try to obtain an estimate as to the possible cost of conversion from a manual system. They can continue to move forward but before making a final decision they will need to have an idea as to what is possible given available funds, technology, and technical support. At this stage important questions would include:

- What do they see as possible and achievable given available funding?

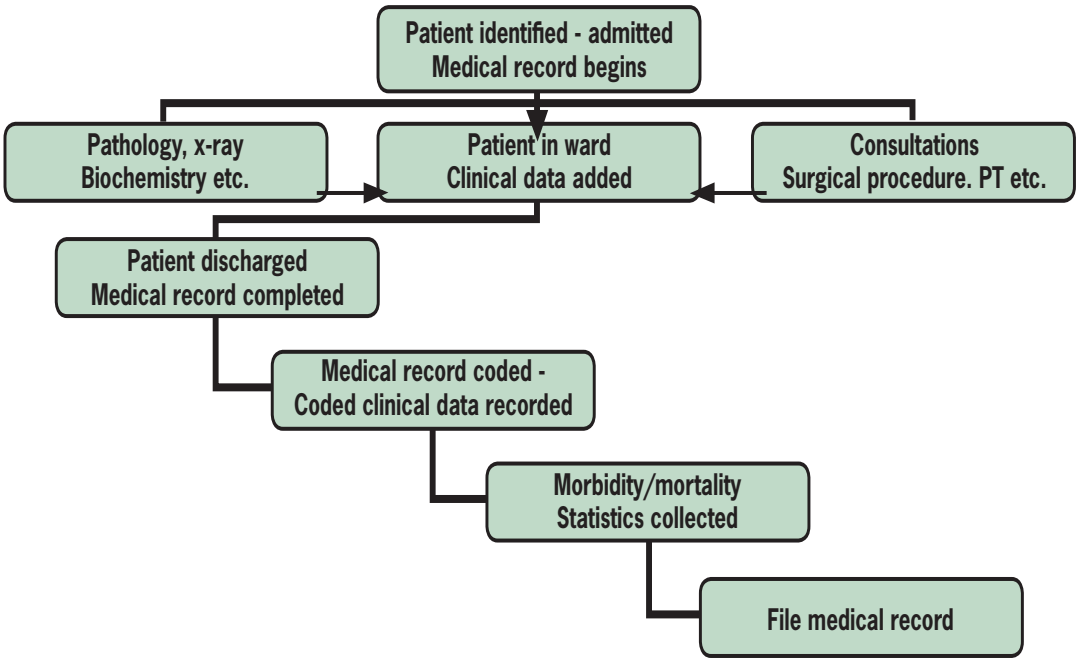
- What type and size of computers are required to meet the needs within available funds?

- What technical support is needed? What is currently available?

- Will the current telecommunication system available meet the identified needs?

- Would expert information technology and health information management advice be readily available?

Manual Medical Record Information Flow



In an electronic health record information flow for inpatients should be the same as for manual medical records as outlined in the diagram above. The record commences on the admission of the patient with registration and identification data verified. In the ward, all healthcare data would then be entered electronically at the bedside or nurses station via a terminal or other electronic device by attending healthcare practitioners. Other data would be added to the patient's record electronically from other departments such as pathology, biochemistry, radiology, etc. On discharge or death the health record would be checked electronically for completion, diseases and procedures coded, and statistics compiled.

The introduction of an EHR should be aimed at increasing the efficiency of healthcare delivery by the institution and/or country, and containing costs by eliminating the unnecessary duplication of services. In addition, as for current paper records, it must ensure the confidentiality of data, improve the quality of care and help to promote the health and wellbeing of the population.

References:

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CHAPTER 3 Issues and Challenges

If a decision to introduce an electronic health record system has been made, the next step is to identify and address issues and challenges that may affect successful implementation.

The benefits of an electronic health record system are many. If the planned benefits are not achieved or do not seem to have been achieved, the value of the system or future systems may be questioned.

Issues and challenges therefore must be identified and addressed before proceeding.

Accurate patient identification is the backbone of an effective and efficient health record system, whether manual or electronic. As discussed previously unique patient identification is a major issue that should be addressed before moving forward to automation. Other possible issues may include:

1. Clinical data entry issues and lack of standard terminology
2. Resistance to computer technology and lack of computer literacy
3. Strong resistance to change by many healthcare providers
4. High cost of computers and computer systems and funding limitations
5. Concern by providers as to whether information will be available on request
6. Concerns raised by healthcare professionals, patients and the general community about privacy, confidentiality and the quality and accuracy of electronically generated information
7. Quality of electronic healthcare information and accuracy of data entries
8. Lack of staff with adequate knowledge of disease classification systems
9. Manpower issues – lack of staff with adequate skills
10. Environmental issues – electrical wiring and supply of electricity, amount and quality of space needed for computers, etc.
11. Involvement of clinicians and hospital administrators

1. Clinical Data Entry Issues

The chosen computer system must be able to identify statements such as 'the patient presented with red weepy eyes' and associate them with other data for future processing. Use of local terminology could be a problem when trying to implement a system across a wide variety of healthcare settings or even within an institution. Most institutions are currently looking at adopting a standard, comprehensive vocabulary to help facilitate a broader use of available clinical decision support systems to ensure that data entered is comparable to other data entered. There are several such commercial vocabularies available, such as SNOMED CT, developed by the American College of Pathologists. Having been developed in a particular country, it may or may not be suitable for your environment.

The other possibility is to use or develop a data dictionary. A data dictionary is a set of common standards for data collection and is used to promote uniformity in documentation, data processing and maintenance. Clinical data standards are developed to ensure that data collected in one hospital department or facility means the same in another department or facility. If purchasing an EHR system, most computer firms have a data dictionary incorporated within the system that is unique to their system. However, the institution may compile a simple data dictionary to meet the needs of their institution. Each entry in a data dictionary would contain the data element such as **'personal identification'** with a definition or descriptor such as **"the unique number assigned to each patient within a hospital that distinguishes the patient and his or her health record from all others" (Johns, 2002)**

The Steering Committee needs to review what is available and determine if any would meet their specific needs.

The lack of standard terminology could be a major stumbling block to the successful introduction of an electronic health record system.

Providers also need to be educated on:

- The benefits of using standard terminology for clinical decision making support; and

- Need to educate and train users in health record documentation, to prepare them for the implementation of an EHR system and also for managing work flow changes.

2. Resistance to Computer Technology and Lack of Computer Literacy

Even in today's environment many healthcare professionals still resist the use of computer technology when attending to a patient. They prefer to write by hand, finding it difficult or uncomfortable using electronic media. Newer technology, however, such as small wireless devices,

notebook computers, and mobile phones with data capture capability, as well as improvements in voice and handwriting recognition devices are beginning to address such issues.

In many cases, however, the issue is not resistance to computer technology as such but a lack of computer literacy. This can be a major issue, not only for medical and nursing staff but also for clerical and other staff. If automation is planned, attention needs to be paid to this issue. Some institutions have found that the introduction of a basic computer skills course for personnel has helped alleviate the situation. Resistance to attending such courses could be a problem and the staff needs to be encouraged and supported to overcome their reluctance.

Successful implementation of an EHR will be dependent on the computer skills of all healthcare professionals and other staff. Although in today's world many use computers, particularly the Internet, some are still not proficient in this area as they do not routinely use computers at work or at home.

3. Strong Resistance to Change by Many Healthcare Providers

Overcoming uncertainty and resistance to change will also challenge the implementation team. As with resistance to computer technology this has been one of the most discussed issues affecting the introduction of electronic healthcare systems over recent years and one that needs to be addressed before proceeding to EHR implementation.

For many health professionals the change to entering patients' health record data via a computer or other electronic device may be daunting. This issue will require intensive training of healthcare practitioners to help them become more comfortable with, and ensure acceptance of, the new technology.

Overcoming resistance to change by healthcare professionals, whether in a manual system or an electronic one could be a challenge but with the right strategy could be overcome. As mentioned previously, the main strategy to have in place to help overcome such resistance is to have them involved from the outset in discussions on the development and implementation of an EHR. As well as being trained in the technology, they need to be involved in system selection and design.

4. High Cost of Computers and Computer Systems and Funding Issues

Perceived high costs of computers and computer systems and lack of funds for healthcare has been seen as a major issue in the development and implementation of an EHR. Health administrators and government officials see such an undertaking as an investment that must be self-supporting in a time when available funding for healthcare is limited

and overall healthcare costs are escalating. The initial outlay associated with the introduction of an EHR would undoubtedly be significant, both in time and finance, to tailor it to the individual needs of the institution/country and to deal with the broader aspects of the change to the new system. It is therefore important to identify specific requirements, as well as clinical practice guidelines. In addition, administrators should undertake a comparison of current system costs plus perceived costs for the new system against the proposed benefits for the change to determine the long-term value of the anticipated EHR system.

5. Concern by providers as to whether the information they generate will be available on request

Providers need to be assured that while the information will not only be readily available at all times, they will be able to access it more efficiently. This assurance should also include the availability of information from other sources such as pathology, radiology, pharmacy, etc. In fact, the information will be more readily available than in a manual system where medical records are filed in an MRD which is not open 24-hours a day.

6. Concerns raised by providers, patients and the general community about the privacy, confidentiality and quality of information generated

Everyone involved, including the patient, healthcare professional and the general population, needs reassurance that all data generated is maintained in a secure environment. As with paper-based health records, local laws to cover electronic health records which address such concerns must be up-to-date and in place. The relevant legal issues should include retention schedules and how information is to be retrieved from electronic media on which it is stored. The durability of the electronic media must also be tested and documented.

7. Quality of electronic healthcare information and accuracy of data entries

As with manual systems, the accuracy of electronically recorded data is also a concern for healthcare administrators and professionals. Many advocates of EHRs, however, believe that electronic health records are in fact more likely to be accurate and readily available than manual records. In addition, it is suggested that the quality of electronically recorded data is better as there are measures in place, such as edit checking, aimed at ensuring accuracy.

Remember the characteristics of data quality include:

- Accuracy and validity of the original source data;

- Reliability – data is consistent and information generated is understandable;
- Completeness – all required data is present;
- Legibility – data is readable;
- Currency and timeliness – data is recorded at the point of care; and
- Accessibility – data is available to authorized persons when and where needed.

All these characteristics are important in both manual and electronic record systems and when changing to an electronic system they must be kept in mind and addressed. Whatever the system, the quality of healthcare data is crucial, not only for patient care but also for monitoring the healthcare services and the performance of the institution.

8. Lack of staff with adequate knowledge of disease classification systems

Currently, there is more computer-assisted coding than coding entirely by computer. Work is continuing on the development of online coding but it will be some time before computers can take over coding completely in most countries. The training and education of competent coders is still a major problem in many countries, particularly developing countries where the availability of, and access to, coding training programs is extremely limited. If this is the case in your institution consideration should be given to the possibility of recruiting an expert in this area to offer coding programs. The staff to be trained should be carefully selected. They should have good clerical skills and attention to detail. Training should include sessions in medical terminology if the people selected do not have a medical or nursing background. The training also needs to include the use of computer-assisted coding systems.

9. Manpower issues – lack of staff with adequate skills

The availability of a well-trained workforce is another issue for consideration when preparing to introduce an EHR system. In many developing countries, staff may be available but their skills may not be adequate for the tasks expected of them. Again, this would require some form of in-service training program to develop the skills required. Persons to be trained again should be carefully selected and be motivated to learn to improve their skills. Incentives may need to be offered such as a better position within the institution.

10. Environmental issues

A major concern in many developing countries is an available and reliable supply of electricity within the healthcare facility. If electricity supply is a

problem, it will need to be addressed before moving forward.

Another important environmental issue is the amount and quality of available space needed for computers and other equipment. A review of existing space should be undertaken to determine if it is sufficient and appropriate to house the required equipment.

11. Involvement of clinicians and hospital administrators

When planning a system to be used in the healthcare environment, it is important for those involved in its development to have a thorough understanding of clinical data and how health professionals use that data in clinical decision making. In addition, the involvement of clinicians and hospital administrators in the identification of information/ data is essential. Their specifications and input are important for their acceptance of the system especially issues relating to ownership of the information.

Willingness by healthcare providers to collaborate and share data with other providers and also with the patient could be the most difficult of the non-technical issues to be addressed. This is an example of one of the many challenges and issues that need to be overcome.

If the system does not meet expectations and users have a bad experience, overcoming that experience could be a greater challenge than overcoming other issues.

Safeguards which may also need to be addressed:

As with manual systems, safeguards must be in place to ensure against loss, destruction, tampering and unauthorized use of electronic records. Some safeguards may include plans for:

- Data back-up as in any computer system, there must be an efficient back-up system available
- Contingency plans for disaster recovery also need to be in place in the case of an electrical breakdown or other emergency
- Securing workstations and requirement of passwords for all users. The passwords should be changed regularly to maintain security
- Access control to ensure health records are available when needed for patient care and other official purposes but may not be accessed by unauthorized persons
- Audit controls where access may be monitored to ensure only authorized persons use the system and to identify when changes are made in the record

Administrative security requirements for risk analysis processes and for management must also be in place. There should be an information security officer designated to perform clearance checks on members of the workforce who will have regular access to the system. In addition, incident reporting and response mechanisms must be available, as should be the means for ongoing monitoring and evaluation of the system to ensure that all users adhere to the stated standards. Policies and procedures and workforce training need to be in place to ensure that uses and disclosures are made only as permitted or required by law.

Remember that it may be possible to implement a well designed EHR but if potential issues and challenges have not been addressed, and if users have not been involved in the design or in the selection of the system, are not properly trained, and/or are not supported by the healthcare authorities, the system may not be used effectively and may therefore fail to produce the anticipated outcome.

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SNOMED International. 2004 SNOMED Clinical Terms Core Content as of Jan 2004. Available at http://www.snomed.org.

CHAPTER 4 Planning for the Introduction of an EHR

Once the decision has been made to go ahead with the introduction of an EHR, and all issues and challenges are identified, the next step would be to form a Steering Committee to undertake the planning and development of the proposed system. This Committee should consist of members of the administration, health information management, potential users from the medical and nursing services, representatives from financial and IT services, and any other individual identified as important to include.

The Steering Committee should seek to ensure that there be early input from members of medical, nursing and other key personnel within the institution. Remember:

It is extremely important that there is support from the anticipated users of the system who need to be involved from the onset of discussions.

The first job of the Steering Committee would be to follow-up the Executive Committee's review of the existing health record system and determine if there is any section needing further review such as current patient identification and healthcare documentation. It is important that members of the Steering Committee understand:

- The current situation;
- The presence of any problems that may need to be addressed before a change can be planned; and
- The assessment of the attitude of both clerical and medical/nursing staff to the proposed change.

Once the Steering Committee has been able to investigate the current situation, undertake problem solving, and recommend steps for improvement, if necessary, they need to commence planning for the development of the proposed system. Some steps they need to take include the:

- Preparation a report outlining the perceived benefits of a system change;
- Outlining how existing data and security standards will be adopted;
- Preparation of a statement on privacy, consent and other medico-legal issues, emphasizing how the privacy and security of patient healthcare information will be maintained;

- Identification of who should be involved in terms of both clinicians and consumers;

- Introduction, if not already available, a unique means of identifying individual patients;

- Development of a timeframe for implementation and funding.

With the information collected and addressed, the Executive and Steering Committee should be ready to:

1. Determine the type of EHR envisaged by the institution/country

2. Identify perceived benefits of an EHR system (added from Chapter 1)

3. Set achievable outcome goals that will meet the needs of both users and consumers

4. Devise strategies in preparation for an EHR

5. Develop policies for use in an electronic health record system

1. Determine the type of EHR envisaged by the institution/country and it's respective government

The type of EHR system the institution/government wants given available resources should be determined. Critical questions which should have been addressed by this stage include:

- Is it possible for the institution/government to move from a paper health record to a fully electronic health information system?

- Would the institution/country be able to manage all health information electronically? That is, implement a fully integrated evidence-based healthcare system with the distribution of an individual's healthcare information beyond acute inpatient situations to ambulatory care including nursing homes, rural or outlying clinics, home healthcare, etc

Given the situation in your institution/country, what would be feasible? Would the institution be looking at a simple approach as discussed previously such as:

- The proposed electronic health record will be limited to hospitals within the region/country?

- The proposed electronic health record will be implemented at a single hospital?

Whatever the extent determined, the expectation should be that the introduction of an EHR will provide immediate access to data and enable processing that data in a variety of ways to support both the decision-making process by health professionals for patient care and clinical and health services research.

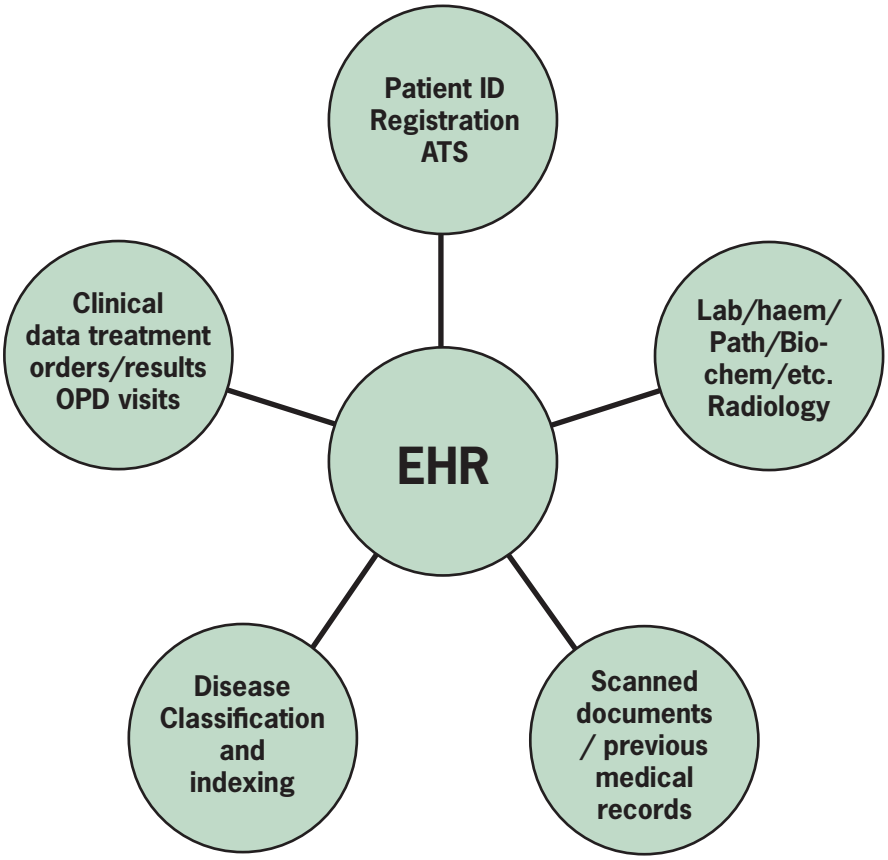
If a simple electronic health record is envisaged it could be defined as follows:

The proposed electronic health record will cover the following:

- **All personal health information about an individual, entered electronically by healthcare providers at the point of care over a person's lifetime;**
- **Accessibility by healthcare providers and departments within the hospital from which the patient has received care;**
- **Organization of information primarily to support continuing, efficient and quality healthcare within the healthcare facility.**

A diagrammatic example of a simple electronic health record is shown below indicating some areas feeding into the record from units/departments within the institution. There could be others depending on the extent and scope of the system.

A Simple Electronic Health Record System



2. Identify perceived benefits of an EHR system

The Executive and Steering Committee, with the assistance of the consultant, if one has been appointed, should be able to identify what benefits they see as possible with the introduction of an electronic health record. For example, benefits could include, but not be limited to, the following:

- Patients will be uniquely identified at all times
- All healthcare information generated within the institution will be documented at the point of care
- Standard terminology will be used to ensure information is universally understood
- All health records will be accurate, reliable, and completed promptly
- Data will be processed to support better decision-making by healthcare practitioners
- Information about an individual patient will be immediately available at all times for present and future care
- Quality of healthcare will be enhanced by the provision of better information for clinicians to make decisions about treatment and healthcare planning
- Patient confidentiality and privacy will be maintained
- With improved clinical documentation at the point of care, problems associated with coding of diseases and procedures will be eliminated
- Morbidity and mortality statistics will be completed promptly and accurately
- Problems relating to filing, loose sheets, etc will be eliminated
- Space problems associated with the storage of paper medical records will be eliminated
- Increased efficiency of the institution with decreased costs in the long-term

3. Set achievable outcome goals

Once the extent to which automation may be achieved has been determined, the Executive and Steering Committee need to set outcome goals that will encompass the perceived benefits and meet the needs of both users and consumers. They should be clearly stated making sure that they are both

realistic and achievable. By changing to a simple electronic health record system within an institution the goals could be to:

- Ensure that all healthcare data is comprehensive, timely, accurate and readily available at all times for patient care
- Improve communication between healthcare providers at both data entry level and data retrieval level
- Provide better access to an individual's healthcare information and improve healthcare delivery by sharing their data between attending practitioners
- Enable individuals to access their personal health information
- Provide timely and accurate information for medico-legal purposes
- Provide timely and accurate information for the collection of morbidity and mortality statistics, for clinical research, and teaching
- Support the administration in their policy decision-making and public health reporting

If a longitudinal electronic health record is planned, the goals could include the provision of a better link between primary care centers, between primary care and secondary care (hospitals), and between hospitals.

The goals should not simply be to change processes for the sake of change but to improve the outcome of healthcare.

4. Devise strategies in preparation for an EHR

When determining strategies in preparation for the introduction of an EHR system, it must be kept in mind that the institution/country is in the process of introducing a major change within the healthcare delivery system and managing that change effectively and efficiently will be crucial to a successful outcome.

Strategies should include the identification of critical factors to success. They could include, but may not be limited to, a strategy for:

a) Patient identification

b) Documentation standards – for the exchange of information

c) Incorporation of provider signatures

d) Education and training of all staff – medical, nursing, administration, and clerical

e) Storing electronic health records

f) Risk management

g) Quality assurance

h) Personal Health Records – with the current trend for patients to be more involved in their own healthcare personal health records are playing a greater role in healthcare in many countries

The Steering Committee will also need to determine how they will communicate the planned changes and market them to providers and consumers. In addition, work practice issues need to be addressed as well as possible issues and challenges that may cause problems and delay in implementation such as lack of available personnel with technical expertise to operate the system; lack of data processing facilities; and staff lacking computer skills.

a) Patient Identification

As mentioned many times, an essential step to be taken when preparing for the introduction of an EHR is to ensure that all patients are uniquely identified at all times.

Some form of Unique Patient Identifier is essential to provide the linking mechanism that underpins the EHR.

In many countries, national patient identification numbers are already being used. If this is the case in your country, you are already on the first rung of the ladder to implementing an EHR. If it is not possible to have a national identification number, the current system used for patient identification should be used and adapted if required but if there are problems with patient identification that need to be solved before moving forward.

As previously mentioned, identifying information should be stored in a **Patients' Master Index (PMI)** and would include demographic information such as a unique patient identification number, medical record/hospital number, date of birth, sex, address, and other specific demographic information. Currently, many institutions have already automated their **PMI**. If this is not the case, an electronic patients' master index system is essential when considering implementing an electronic health record.

Automation would require a group of programs, accessed by users via display terminals, and/or printing terminals. The programs would be designed to enable access to the information held on the PMI file, and to build or modify the file information as required by the institution.

b) Documentation Standards for Information Exchange

Just as there are a set of standards for manual medical records and medical record services, there also need to be standards in electronic health records systems. The Steering Committee needs to ensure that standards are in place to address definitions of data to be exchanged, the timing of the exchange, the management and integration of data to support patient care, and the evaluation of healthcare services.

There are several accredited standard-developing organizations operating in the international healthcare industry, the most well-known being Health Level 7. This organization and the standards they develop are known as HL7. These standards are developed to provide a structure that defines data and data elements and specifies how data is coded.

Specifications developed by HL7 include the widely used messaging standard that enables disparate healthcare applications to exchange key sets of clinical and administrative data. Such standards have been developed specifically to create flexible, cost-effective approaches, standards, guidelines, methodologies and related services for interoperability between healthcare information systems (HL7 2005).

The use of internationally accepted standards in individual applications will improve the integration of the application with other applications in the system. A decision needs to be made as to which, if any, standards organization the institution/government will use. In many commercial EHR systems standards are already imbedded within the program.

c) Incorporating Provider Signatures

In an electronic health record, as in manual records, treatment and medication orders must be signed. The authenticity of an electronic signature is extremely important particularly when the record is used for documentary evidence in legal cases.

In an electronic system, authenticity is often easier with documents automatically stamped with date, time, and user identification. Some systems use the provider's password as verification of their signature. This is accomplished by requesting that the password be entered a second time for verification.

Some countries do not see this as sufficient and plan to use a digital signature created cryptographically. Cryptography keeps data secret through mathematical or logical functions that transform intelligible data into seemingly unintelligible data and back again so as to authenticate the user and provide non-repudiation (Amatayakul,

2004). That is, it is a process that enables positive identification of the sender of a computer message so that the sender cannot deny sending the message

d) Education and Training

One of the most crucial issues when preparing to introduce a major change in any organisation is the training and education of users of the system. The change from a manual medical record system to an electronic health record system is a major change and many people – healthcare professionals, administrative, clerical staff – need to be thoroughly trained if the change is to be successful.

Resistance to change or hesitancy in electronic documentation needs to be addressed and although some staff may still be hesitant, they may be willing to become involved. It is extremely important to gain the confidence of all staff particularly medical and nursing staff. As the major users of the system, doctors and nurses need to understand how the system will function and be confident that all legal and ethical issues will be safeguarded.

e) Storing Electronic Health Records

A strategy needs to be in place to address the storage of electronic health records. As for manual medical records, the electronic health record needs to be maintained in an accessible media for future retrieval for patient care and other uses such as research and teaching. The Steering Committee should identify whether previous health records will be scanned and included as part of the system, how they will be stored, and if the system will include emergency attendances.

The strategy should include what type of media will be used to store the EHR

Primary storage is usually maintained in the central processing unit (CPU) with information readily available online. When developing a strategy for storage, it is important to remember that speed and backup are important considerations as it must fully support continuous and instantaneous access to data.

Secondary storage also needs to be considered. An EHR system stores huge amounts of data and decisions need to be made on the type of storage device to be used. The better-known devices are magnetic tape, hard disk systems, and optical disks. The latter are well suited for storing multiple media including images such as x-rays. It may be on-line to the CPU for real time access or off-line requiring on-line loading.

Other questions and issues on storage to be addressed would include:

- What are the environmental conditions? Are there any physical hazards?

- What control will there be for equipment and media? Who may have access?

- What contingency plans are in place if the system is down – secondary or back-up copy?
- What will the storage period for each record type be? – local laws need to be taken into consideration; and

- A plan is in place for the transfer of electronic health records to new media before degradation occurs.

f) Risk Management

A risk management strategy should be in place to address any foreseeable barriers to the implementation of an EHR. Elements of this strategy should include plans to:

- Ensure adequate funding is available to provide the source applications, hardware infrastructure and implementation resources with a funding/financial management plan in place to incorporate ongoing needs
- Ensure sufficient skilled resources, both human and technical, are available to provide program management during implementation and to give on-going support
- Develop and implement a marketing strategy to promote the benefits of the proposed EHR to consumers and healthcare providers such as brochures or a newsletter to keep personnel up-to-date with developments

g) Quality Assurance

This strategy should set out the aims of an EHR, which should include improving health outcomes, population health, and the management of health resources and services by:

- Providing better information for clinicians to make decisions about treatment and care planning
- Supporting a best practice, evidence-based health system
- Increasing access to information for medical audit purposes
- Providing decision-support to allow clinicians to make the best treatment decisions for their patients

- Ensuring the availability of medical alert and prescription decision-support to reduce adverse events
- Providing information to support an understanding of service utilization patterns and better service planning

h) Personal Health Records

A decision as to whether a personal health record (PHR) will be an integral part of the EHR plus the form it will take should be determined during the planning stage.

In some countries a personal health record is provided via a smart card, like a plastic credit card. It is used to store patient information including identification and demographic details, allergies, and blood type, as well as current health problems and medications, including recent findings (Hebda et al, 2001). They may also include the patient's photograph for positive identification. Patients carry their smart card with them when they attend a healthcare facility and present it to the provider who processes it via an electronic card reader. The card is not part of an electronic network and provides detailed accurate information that is readily available. Such personal health records are popular in some countries and contain varying levels of information.

5. Develop policies for use in an electronic health record system.

Policy development is essential to ensure that existing policies have been revised and redeveloped to address the implementation of an electronic health record system. A policy is a basic guide of action that prescribes the boundaries within which activities are to take place. It is important to identify how the proposed automation of health records will affect existing policies and procedures and revise them accordingly. Some policies required may include:

a.) Information Flow

In a simple EHR system the information flow for inpatients should be the same as for a manual system except that data will be entered at the nurses' or doctors' station in the ward via an electronic device with other data transmitted electronically from other departments where the patient has received tests, treatment, etc. An existing policy on information flow should be reviewed and revised to incorporate electronic data entry.

The actual entering of clinical data at the time the provider visits a patient has been an important factor that has restricted the implementation of a fully electronic health record in many institutions. To overcome this problem, data entry has been improved by using a structured format that prompts the provider.

b.) Work Flow

Current work-flow policy needs to be reviewed and revised to meet the demands of the electronic system as there will be many changes particularly in the MRD. Work-flow varies from one healthcare setting to another and needs to be clearly understood and documented before implementation.

c.) Content and Format of the Health Record

The current paper record content and format should be assessed to see if they are suitable for adaptation to the electronic system. Forms may need to be redesigned to enhance data entry. The record format needs to be of a kind that will ensure efficient retrieval of needed data.

In a manual system, procedures should be in place to enable correction and amendments to data entry in health records with strict guidelines for correcting data and reports. The same will apply to electronic data entry. In paper records, corrections in a record entry are easily identified. This may not occur in an electronic record and the computer program should provide an audit trail that shows when changes were made and by whom. Policies on how data is to be validated also need to be in place as well as rules for the completion process following the discharge of an inpatient (that is, how clinicians complete their records).

Completion of a health record by the attending physician should be done at the time of discharge.

A standard form of patient consent for treatment needs to be designed with detailed policies and guidelines for its use, including how the patient's signature will be incorporated. In many cases the signed Consent Form is scanned and included in the EHR.

d.) Downtime Policy

A policy and procedure needs to be in place to address issues relating to downtime and backup. How the system is to be backed up is an important issue and implementation cannot take place until this has been determined.

e.) Printing Policy

There needs to be a policy on printing documents. It must be determined for what purposes a record will be printed. Ideally, for patient care, all entries and retrieval of data would be via the

computer. Copies will be printed and will be traced by an audit trail to identify users who have printed reports from the system. This is to ensure that the patient's privacy has been maintained.

f.) Retention Policy

It is critical to determine the length of time documents and data is to be retained. Information will need to be culled and a policy needs to be developed to cover what data will be retained and for how long.

Other policies and procedures that may be unique to your institution and should be in place before proceeding to implementation should be identified and addressed.

Next Steps in the Planning Process

The next steps in planning for the introduction of an EHR would be to appoint a team to oversee implementation and establish a number of working groups to assist with the development of policies relating to specific tasks.

1. Appointment of an implementation coordinator and an implementation team

Skilled information management personnel and a well-trained technology workforce are essential for successful implementation of an EHR. An appropriate organisational structure also needs to be in place and key users made ready.

The institution/country should determine whether the Steering Committee will be given the task of implementation or a team of dedicated staff delegated for the purpose. Some members of the Steering Committee may be ready to move on as their specific task has been completed, some may not feel able to be part of the implementation team, while others may be both willing and competent to participate in the implementation. Given the critical nature of the implementation phase, however, two groups may be required – the Steering Committee to see to the overall implementation and a dedicated team to undertake specific tasks as outlined in the plan.

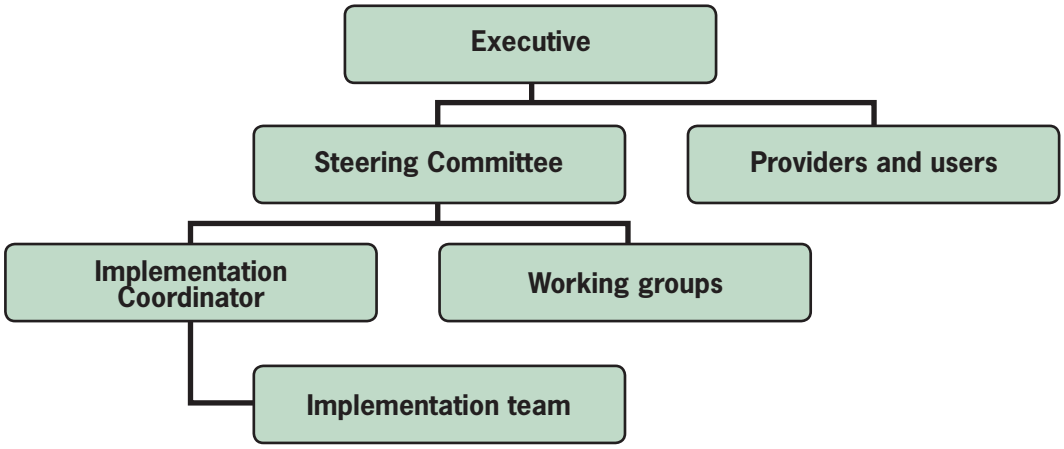
An implementation coordinator will lead the implementation team and may have a title such as Program Coordinator or Project Manager. This person may be a member of the Steering Committee, someone already on staff, or someone specifically employed for the task. Alternatively, the institution/country may wish to employ a consultant or outside advisor with a broad range of experience in health information management and electronic health record implementation to assist the Steering Committee.

The implementation team leader will be responsible for coordinating the implementation of the new system. The person appointed or contracted for this role must be respected and valued by his or her peers, be a good

communicator, a strong leader with good negotiation and problem-solving skills.

The implementation team (whatever its form) should include a skilled workforce with the expertise to support the Steering Committee, implementation coordinator, and potential users. Remember that it is extremely important that all potential users are involved in the formulation of policies and guidelines to foster participative decision-making – vital to the successful introduction of the new system.

Organization Structure



2. Establishing a number of working groups for specific tasks

A number of working groups need to be identified and appointed for each specific responsibility such as a/an:

a.) Information Security Group – to deal with medico-legal aspects including privacy and confidentiality issues
b.) Education and Training Group
c.) Quality Assurance Group

More groups may be required and the Steering Committee, in conjunction with the implementation coordinator and team, need to identify areas needing special attention.

a.) Information Security Group – medico-legal aspects including privacy and confidentiality

The Steering Committee should appoint a team to develop and maintain a medico-legal checklist, incorporating government regulations, to guide the implementation and on-going use of the EHR. Remember that measures need to be directed at ensuring appropriate security and storage of information to prevent improper disclosure.

Within the institution/country an Information Security Policy should

be in place, with standards, implementation guidelines, and an action plan. Compliance with such a policy will safeguard the accuracy and completeness of information and ensure that:

- Only authorized persons have access to healthcare information
- **Dependant** privacy policy and related legislation are upheld
- Information is stored and handled in a secure manner

Implementation of an Information Security Policy will ensure that information related to health encounters will be protected from unauthorized access when the EHR is operational. It is important to remember that for a manual health record system the privacy and confidentiality of patient information in an electronic health record must be protected at all times.

b.) Education and Training Group

A training team needs to be in place to develop education and training programs. As previously discussed, on-site training is required to address work practice issues and develop a group of competent users, confident in their knowledge of the proposed system and ready to accept the change. The Steering Committee may identify the need to have more trainers than staff on-site during early preparation for the introduction of an EHR system.

Systems have been known to fail because individuals required to use the system have not been adequately trained and do not understand the system. They also may not have been involved from the beginning of discussions and negotiations. Training, however, should commence with the more interested users with keyboard skills and a better knowledge of computers who will subsequently be used to promote to the less interested, motivated or skilled persons.

Remember, a key ingredient for successful implementation is user-involvement from the beginning. It is critical to success. So too is training.

The first step would be to conduct a needs assessment to determine the level of training required for all data providers and data users. From this assessment, the Education and Training Group will be able to identify the training needs of users, determine content of the training program and methods of teaching and set up a schedule for classes. When the above has been completed the group needs to determine the location where training will take place and what hardware and software will be needed. It is also important to estimate the costs of training and how the programs are to be evaluated.

From the needs assessment it may be found that not all users need training at the same level and that different levels of classes may

need to be conducted. The first group to be trained should be the trainers and a program (specifically to "train the trainers") needs to be designed and implemented. This group will then take on the responsibility to train the rest of the providers and other users. Training will be an on-going function and will not stop when the system is up and running. There will always be new providers and users requiring training before using the system.

It may be wise to consider some one-on-one training sessions for clinicians who may be reluctant or too busy to attend group sessions.

The training group would need to:

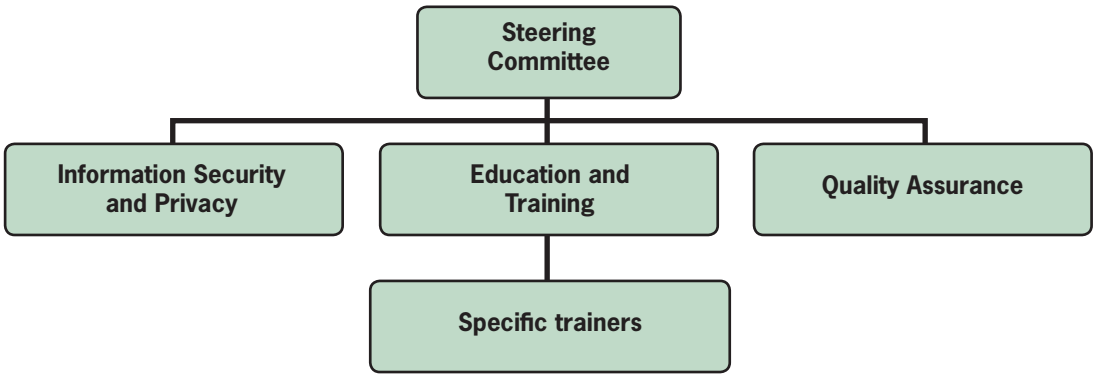
- Prepare a training program with clearly stated learning objectives. The program should aim at not only educating staff but also ensuring that the value of the EHR in healthcare delivery is understood.
- Start training sessions with a "train the trainers" program to enable the development of a training workforce.
- Present the programs clearly and enthusiastically enabling hands-on experience.
- Encourage members of the health services to commit to reviewing work practices and endorse the changes required to implement the EHR for maximum efficiency gains.
- Prepare staff to participate in defining the new work practices and developing policies and guidelines to promote user-ownership and increase compliance.

c.) Quality assurance group

A quality assurance coordinator and team should be established to oversee that data collected and processed are accurate, reliable, and organized in such a way that they are both readily understood and available when needed by healthcare providers. To ensure that documentation meets the required standards, quality assessments must be undertaken beforehand and continued on an on-going basis. Poor quality data is a major hindrance to planning and decision-making and data quality is an important concern for healthcare institutions and governments, regardless as to how data is recorded and processed.

As shown in the following diagram the working groups will be responsible to the Steering Committee and should report back to the Committee on a regular basis.

Working Groups



Remember that an essential requirement for the successful implementation of an electronic health record system is the cooperation and commitment of all staff to the new system, including administration, medical and nursing staff, other healthcare professionals, and computer and clerical staff. It also must be remembered that just selecting an electronic health record system that has been implemented elsewhere and expecting it to work for your institution /country could cause disappointment if it does not meet your perceived needs or available resources

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HealthConnect (2000). *A Health Information Network for Australia: Report to Health Ministers by the National Electronic Health Records Taskforce.* Commonwealth of Australia, Canberra.

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CHAPTER 5 Factors to be Considered when Developing an EHR Implementation Plan

When the type of EHR system has been determined, goals identified, issues and challenges recognized and addressed, some strategies devised and documents relating to policies and procedures covering the proposed EHR System prepared the next step is the development of an implementation plan. Some factors for consideration when developing a plan for implementation are outlined in this chapter.

The implementation plan should show all steps required to move from a manual medical record system to an electronic health record system. A successfully implemented EHR system should promote and meet the specific, stated EHR goals of the institution/country. Most importantly, it should also improve the overall performance of the institution and the services it provides.

A sound implementation plan can mean the difference between success and failure.

Factors to be Considered

It is extremely important when planning for a change to an EHR to anticipate the impact of the introduction of an EHR on work-flow, productivity, users, and patients. There are many factors to be considered when developing a plan for implementation for example:

1. What computer systems does the institution currently have?
2. What form will the implementation take? Will it be phased in? How?
3. How will past data be integrated and old data retained?

1.) What computer systems does the institution currently have?

Determine if the proposed system would be compatible with electronic data systems (if any) already in use by the institution/country. They may include:

- **Electronic Patients' Master Index (PMI)** – As outlined previously, an electronic patients' master index system is essential and, if not already in place, should be the first step undertaken when changing to an electronic health record system.

- **An Automated Patient Administration System (PAS)** – This would also be critical for the effective operation of the proposed system. An admission, discharge, and transfer system enables staff to maintain a file on all patients awaiting admission, currently in hospital, transferred within the hospital, recently discharged or diseased. It enables authorized users to have direct access to the patient's information. It also automatically generates the bed census and other daily statistics required by the administration.

- **Clinical Systems** – In many institutions/countries, systems are already in place that are capable of reporting results – laboratory, pathology, radiology, treatment orders and medications, surgical reports, discharge summaries, etc. Some specialized units offer forms of clinical documentation may have already been implemented.

- **Automated clinical coding and disease and procedure indexing** – in many institutions/countries computer-assisted coding of diseases and procedures is conducted on-line. If this is not the case in your institution/country this is another important area to be developed and implemented. With such a system the use of a standard medical vocabulary is essential. With the use of automated clinical coding, data quality will be monitored automatically.

2.) What form should the implementation take?

The Steering Committee needs to determine whether they want to move into full implementation, have phased implementation, or start with implementation at a pilot site. The readiness of the site, readiness of all users to accept change, and the availability of funds for implementation are a few of the issues that may influence the Committee in its decision on the form implementation should take.

- **Full Implementation** - In an environment with a strong technical infrastructure, the tendency may be for full implementation. This would require detailed preparation with all technical requirements in place and working telecommunication infrastructure fully operational, the system tested thoroughly, and all staff ready and fully trained. If this is the desired implementation, data for all active patients must be uploaded immediately before the cut-off – that is, identification and demographic details of all patients currently in hospital uploaded into the new system. Decisions need to be made as to whether the electronic system will run parallel to the manual system for a trial period or take over completely from the manual one. Running parallel systems would ensure backup, but sometimes when systems run in parallel it is often difficult to cut-off later. If the above issues have been addressed and the institution/government sees a possibility of successful implementation, it may

be best to have a complete cut-off from the manual system upon full implementation of the EHR.

- **Phased Implementation** - The second option is to phase-in implementation unit-by-unit. This appears to be preferred by many institutions/countries that realise the introduction of an EHR system is an enormous task with significant change required. It may also be the most appropriate plan for developing countries. With limited resources, both technical and human, phased implementation could help to manage the impact of the change.

Initially, some institutions/governments may prefer limited implementation with a pilot program. A pilot program could enable the institution/government to determine the project's potential, assess its value, and determine the institution's readiness for the system, or buy time to gain user acceptance. Other reasons for conducting a pilot program may include difficulty in managing a major change due to inexperience of the workforce and users, limited staff and technical support, insufficient funds for such a change, or uncertainty as to whether the new system will actually work.

The Steering Committee's decision on the form of implementation needs to be based on all the relevant facts and considerations, including costs, the readiness of the site, users and the system. If the decision is to phase-in implementation the first site should be carefully selected. The first site should be one that is self-contained with fully trained staff to test the system. The unit should not be too big or too small.

Interest of users is another factor to consider when selecting each site and the order the EHR will be implemented. When the first unit has completed implementation the committee and implementation coordinator should be able to assess the impact on users and patients, work-flow, and productivity before the next phase is implemented. Once it is determined that the system is working well, the next unit or units should be phased in one-by-one until all departments/units are online.

3.) How will past data be integrated and old data retained?

By this stage, the Steering Committee needs to have decided how past data will be integrated and old data retained. Questions and suggestions to consider include:

- Will all old records be scanned and made part of the electronic record when the patient first presents for care after the new system is introduced?

- Will old records be scanned and kept in a secondary storage device and brought into the new system if and when needed?

- Old records will not be scanned but summary information of a patient will be entered into the electronic health record when the patient attends for the first with the new system in place.

- Old records will be scanned and remain in manual storage for a prescribed time before being destroyed.

It is important to note that scanning past records could be very costly and that there are other options stated above. If all old records are scanned, a percentage of them will be records of patients who will never return to the facility.

Development of a Comprehensive Implementation Plan

When the form of implementation has been determined, the Steering Committee and implementation team need to ensure that the institution/government is ready to move forward. The next steps would be to:

a) **Select the best system** to meet the needs of the institution government

b) Determine that the required **technological infrastructure** is in place

c) Determine what **clinical data capture and data retrieval** is required and what current data collection is redundant

d) Ensure that important **policies and procedures** are clearly documented

a.) Select the Best System

Know what you want. There are many commercial systems available but individual institution/country requirements are different and the system MUST be able to meet local needs or be able to be adjusted to do so. That is:

- **Select the EHR system that is right for your institution/country**

  What system will best meet the needs of the institution/government? The institution/government, through the Steering Committee, needs to determine whether they want to build their own EHR system, or buy or lease one from a reputable computer systems vendor. All have a significant cost attached. Building one's own system could be time-consuming and expensive but should enable the organisation to design one to meet their specific needs. This, however, would require a high level of expertise that may not be available in the institution/country.

Purchasing a system already developed and implemented elsewhere would have an initially high financial outlay. As there are many EHR systems on the market selecting the one most suitable would require detailed investigation to ensure that it will meet the anticipated definition, needs, and goals of your institution/country.

Leasing the EHR system would enable access to software applications managed off-site. The initial costs would be less than for the other two options but may prove more costly over a long period of time.

Whatever system is determined must be compatible with systems already installed and also with other institutions with whom the institution wishes to share information and needs to interface with.

A thorough cost-benefit analysis should be conducted to compare the options against each other and the costs of any proposed system against the perceived benefits, so as to determine the value of the system to your institution/government.

- **Look at the total picture before committing to a specific system**

What you also need to know in selecting a system are the clinical information needs of your institution/country. That is, determine what is to be captured, stored, and viewed to support the EHR objectives. Developing a framework defining how clinical information is to be captured and represented such as lists, views, or reports in the proposed EHR is essential. The purpose of the framework is to help people developing or selecting the system to decide:

- What information should be recorded;
- How this information is to be described and classified; and
- What are the collection and retention priorities for information.

b) Technological Infrastructure

The technological infrastructure is how hardware and software work together. There are many types of computer system infrastructure and the Steering Committee should review the current (if any) infrastructure and determine what is needed to ensure that the right technical infrastructure is available for the proposed EHR system. Briefly, it should include:

- A **Central Processing Unit** or operating system – The central computer performs all processing and storage functions and sends and receives data to and from terminals and printers.

- **Input/Output** devices – Current devices, if any, need to be assessed to see if they will meet the needs of and are compatible with the proposed system. There are numerous devices available and the type to be used must be compatible with the proposed system

- Network – If the institution already has a set of computers, ensure that they are linked to enable the sharing of software and data. It may be a Local-area Network (LAN), a Wide-area Network (WAN), or a Wireless Local-area Network (WLAN). An efficient EHR system depends on linking information from many sources. With an EHR system, two other network configurations using internet technology are used, intranets and extranets:

    - **An intranet** uses Internet technology that enables users to find, use, and share documents.

    - **Extranets are used to** connect a given institution to its users and business associates outside the physical location of the institution – these would be necessary if a longitudinal health record was planned.

- **Supporting software** – These are programs or instructions that direct the processing of data in computers.

    - **Operating system software** identifies input from external devices, sending output to terminal screens, keeping track of files, and controlling peripheral devices such as printers.

    - **Application software** makes applications perform their functions.

    - **Application integration/interface** is software designed to work together without any external intervention. Interface facilitates the exchange of information across different systems.

    - **Messaging standards** are also called interoperability standards or data exchange standards.

c) Clinical Data Capture and Data Retrieval

What is required and what current data collection is redundant.

- **Clinical Data Capture**
  This is where findings and actions are documented by providers of

healthcare and data obtained about a patient in real-time. How the data is to be captured is important and must not be complicated or time-consuming. Decisions need to be made as to how data will be entered and could include free-text entry or structured data entry from pull-down menus. Most clinicians would prefer 'free text' by keyboard, dictation, voice recognition, or handwriting recognition. Technology is available for all these methods but there are a number of issues involved with their use and the Steering Committee/implementation team will need to investigate all possibilities and make a decision that will best suit the needs of the institution/government.

- **Clinical Data Retrieval**

  When obtaining healthcare data in real-time, access menus and navigational devices are used, such as a mouse, keypad, scroll keys and so on, used to move data through parts of a computer screen. They are important as they enable a healthcare provider to retrieve data directly from the system. This is another area that needs to be fully investigated so as to ensure that the system selected or developed will enable data to be readily retrieved for patient care.

d) Policies and Procedures

As mentioned previously, policies and procedures may need to be revised to encompass the change to an electronic system. The readiness of the institution/country for the change is extremely important and a change management strategy must be in place to ensure a smooth transition. Change management techniques should be used to help health professionals adopt a different form of documenting and using health information.

- **Confidentiality and Security setup**

  As mentioned previously, security must be in place to ensure that all medico-legal issues including privacy, confidentiality, and security are addressed. Security arrangements should be clearly documented and communicated to all potential users.

- **Education material prepared and training programs for users commenced**

  Education programs should start as soon as possible, but not too early that information is forgotten before it can be applied, to ensure that all users are adequately trained by the time the system is ready to 'go-live'.

It is important to remember:

The administration needs to plan, advise, and educate staff, and work with providers and patients to ensure a smooth transition.

All the above factors need to be considered along with others that may be

identified and unique to your institution/country. The decision to go ahead cannot be rushed. The institution/country needs to ensure that all issues and challenges are addressed, policies revised, and staff trained. They also need to be clear as to where they are heading and confident that they are ready to move forward.

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Amatayakul, M.K. (2004). *Electronic Health Records: A Practical Guide for Professionals and Organizations.* AHIMA, Chicago.

Hebda T. Czar P. and Mascara C. (2001). *Handbook of Informatics for Nurses and Healthcare Professionals (2nd ed).* Upper Saddle River, NJ: Prentice Hall.

WHO (2004). *Developing Health Management Information Systems: A Practical Guide for Developing Countries.* WHO, Manila.

CHAPTER 6 Implementation Plan

The Steering Committee, implementation coordinator, and team should now have a thorough understanding of the environment in which the system will be functioning, the information needs of the institution, functional requirements to ensure the system will work, and most importantly be confident in their ability to effect change. They should understand the overall scope of the proposed system and have decided what information will be loaded into the system before going live.

The decision to convert to an EHR all at once or in stages will also have been made. Assuming the decision was made to phase-in the system by unit or department a timeframe for implementation for each unit should be prepared. The first unit may take longer to implement the system than subsequent units. As the first implementation will be a trial, the plan may need to be modified before proceeding to other units. It is important for the implementation team to ensure each phase is functioning well before moving to the next unit or department.

There may be some unit managers who are ready and very keen to start while others may not be fully confident and wish to see how it works in other places before implementing. This should be taken into account when determining the sequence of units for implementation. When overall phasing has been determined and timeframes established, detailed tasks should be plotted on a plan. Remember that the plan could cover hundreds of tasks.

It is a huge undertaking so successful implementation is particularly important. Thoroughly addressing all the relevant issues beforehand will help guarantee success.

Timeline for Implementation

The timeline for implementation will vary from institution to institution and will be dependent on whether the institution/country has decided to implement the EHR system all at once with a "big bang" or phase it in by unit/department over a longer period of time.

Each step of the implementation plan should have its own timeline to coincide with the overall project plan for implementation.

The timeline or project plan should be mapped out on a large board. Quite often white boards are used to enable changes to be made if or when required. Items would include a detail list of EHR project tasks with a timeframe for each task. Implementation may take days, weeks, months or even years. A realistic timeline should be prepared if possible but everyone should be prepared for changes if problems or unidentified issues arise which may cause a delay in implementation.

The plan should contain the steps previously discussed such as the:

1. Review of current medical record system
2. Identification and addressing of issues and challenges to be addressed prior t implementation
3. Establishment of a Steering Committee
4. Preparation of a clearly defined statement of the type of EHR to be implemented
5. Identification of perceived benefits to the institution with the introduction of an EHR system
6. Preparation of a list of clearly stated goals and strategies for implementation
7. Review of current medical record policies and procedures and develop them to cover proposed changes
8. Appointing of an implementation co-ordinator and team
9. Establishment of working groups
    - Security and Confidentiality Group
        - Prepare a confidentiality, security and privacy policy
    - Education and Training Group
        - Prepare education programs
        - Prepare the education site
        - Identify participants
        - Commence training
    - Quality Assurance Group
        - Prepare quality assurance guidelines and policies
10. Determine record structure and content
    - Ensure a patient identification system is in place
    - Determine an effective means of obtaining the patient's informed consent

- Introduce data standards and the use of a common terminology
- Other

11. Determine technology infrastructure required
    - Cabling
    - Terminals
    - Other
12. Determine telecommunications infrastructure required
13. Determine how system will be phased in

In addition the plan should also include:

1. Site preparation; and
2. System testing.

1. Preparing the Site

The sites for implementation need to be prepared. The extent of the system will determine the number of areas needing preparation. For example, will there be terminals for data entry and retrieval in all wards in the hospital, all outpatient rooms, and other patient service areas?

Before the system can "go live", the technological infrastructure needs to be in place with data entry facilities in all point-of-care areas. For inpatients, they would include the admission office, wards, and other areas at the point-of-care. For outpatients, they would require the reception area and all consulting and treatment rooms. All required cabling for all devices need to be in place and operable.

If a longitudinal health record is planned, data entry facilities need to be in place in all community care centres and outlying clinics. A detailed plan showing the infrastructure needs to be prepared and displayed.

2. Pre-test the System

When the site has been prepared with the appropriate infrastructure, the software in place, all issues relating to confidentiality and security addressed, and all users trained (including healthcare professionals, technicians and clerical staff), it is time to install and pre-test the system at a point-of-care area in conditions that closely reflect actual situations.

The decision as to where the system will be pre-tested should have been made using a set of selection criteria which include technical factors such as the level of expertise of the staff, infrastructure support, and staff support (WHO, 2004). In addition, different levels of staff need to participate in the pre-testing, especially health professionals who will be both providers and users of data. The length of time the system will be pre-tested needs to be determined.

Finally, the system needs to be monitored during pre-testing to identify any problems and to enable informed decisions to be made with regard to further implementation.

Determine Readiness

Questions which should have been asked to determine readiness include:

- Are there any barriers still to be overcome?
- Has everyone who will be involved been trained and are they ready?
- Have any problems identified in the pre-test of the system been reported and corrected?
- Are we ready?

If all these questions are answered positively the system is now ready to implement.

System Startup

The day selected to "go live" should be on a weekend or a day when there are few patients expected. The institution may be able to re-organise admissions and close some outpatient areas. This would need to have been decided much earlier. In addition, it is important that on the day all staff are available and ready with support personnel available to provide assistance as needed. If the system was purchased from a computer company, key members of their staff also need to be onsite.

When all pre-requisites have been addressed, a detailed implementation plan in place, the site ready, all users and support staff trained and ready, and the system pre-tested, the next step is implementation.

It is now time to 'go live'!

Correct course if needed, and enhance the system

As mentioned many times, a major change such as the implementation of an electronic health record system is an enormous task and the staff needs to be on the alert for any problems which may arise. That is, expect the unexpected.
When the first unit/department has gone live it is important to review and correct any identified problems or issues as soon as possible. If it is not what was expected, it is a signal for course correction. When problems are addressed and expectations met, the results can justify further enhancements to the system.

Conclusion

The principal benefits identified for the introduction of an electronic health record system are supporting patient care and improving the quality of that care. Accurate and timely health information, which is accessible when needed by both providers/users and consumers has great advantages for the healthcare of all individuals and would enhance the health and welfare of the community. It will also enhance the productivity of healthcare providers in the delivery of care, and be a strong support to clinical and health service research.

Implementation of EHRs has been said to revolutionise how we collect, store, and use health information. Patients are expected to become more involved in healthcare decisions when electronic systems provide them with easily accessible and accurate information about their health problems and care. It is often advocated that healthcare practitioners tend to deliver better healthcare by being able to more efficiently provide up-to-date details of a patient's healthcare to others involved in treating the patient and by having better access to best practice and the latest research findings.

References:

Hebda T. Czar P. and Mascara C. (2001). *Handbook of Informatics for Nurses and Healthcare Professionals (2nd ed).* Upper Saddle River, NJ: Prentice Hall.

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Annotated Bibliography

Following a Medline search relating to design, definitions, goals, and implementation of electronic health records over the period 2000 to 2005, 84 citations were recovered. Some references have been included to assist readers obtain further information if required.

General Aspects of EHRs

Amatayakul, M.K. (2004). Electronic Health Records: A Practical Guide for Professionals and Organizations. AHIMA, Chicago.

> A practical Guide for persons interested and/or involved in EHR planning and implementation. The book covers elements of the EHR from developing a migration path to implementation and on-going management of the system. It offers the reader an important insight into the history of EHR development, current trends and possible pitfalls.

Audet AM. Doty MM. Peugh J. Shamasdin J. Zapert K. Schoenbaum S. (2004). Information Technologies: When Will They Make It Into Physicians' Black Bags? MedGenMed. 2004 Dec 6; 6(4):2.

> The authors discuss the slowness of physicians in adopting information technology tools in patient care and present their findings of a study designed to investigate physicians' current use of information technology, future plans and perceived barriers to adopting electronic medical records, computerised prescribing, order entry, clinical decision support systems, and electronic communication (e-mail) with other physicians and patients. A self-administered mail survey was used by a random sample of physicians involved in direct patient care. Conclusions showed that there was an uneven adoption and that costs remain the most important barrier to adoption.

Giere W. (2004). Electronic Patient Information – Pioneers and Much More: A vision, lessons learned and challenges. Methods Inf Med. 2004; 43 (5): 537-42.

> Professor Giere from the Centre of Medical Informatics, University Hospital Frankfurt, Germany, introduces the topic of electronic patient records and how, with all its different kinds of patient information, it can be structured in many ways. The primary focus is on the development of an information system for both in and outpatients in Germany in comparison with systems in the USA. He gives an historical overview of what he refers to as the 'iron age' and 'golden age' yielded until the mid-1970's and then following the dark years in the 1980's. In his

conclusion, he suggests that in the future, the use of medical linguistics for successful EMRs should be better supported.

Gillies J. Holt A. (2003). Anxious about electronic health records? No need to be. New Zealand Medical Journal. 116 (1182):U604, 2003 Sep 26.

The authors discuss aspects of both manual and electronic health records identifying some weaknesses and strengths of both noting that the everyday takeover of paper records by electronic versions seems inevitable. The paper aims to reassure clinicians that the EHR is likely to enhance the quality of their professional practice.

Hanauer D. (2004). Disaster recovery for electronic data: Are you prepared? Journal of Medical Practice Management. 2004 Sept-Oct; 20(2): 82-7.

In this article the author addresses disasters that affect medical data and the problems that can arise if data is lost. How to recover lost data is discussed plus how to prevent or guard against disaster in the future and a description of how certain practices in advance could ease the process of recovery.

Hebda T. Czar P. and Mascara C. (2001). Handbook of Informatics for Nurses and Healthcare Professionals (2nd ed). Upper Saddle River, NJ: Prentice Hall.

This is an expanded guide to computer technology for nurses and other healthcare professionals. It contains expanded coverage of intranets, search tools, outsourcing, strategies, planning, security, and patient information. It also contains discussions on electronic communication, strategic planning for information management, disaster planning and recovery, as well as samples and case studies illustrating the practical use of information technology.

James B. (2005). E-Health: Steps On the Road To Interoperability. Health Aff (Millwood). 2005 Jan 19; (E-pub ahead of print – www.healthhaff.org).

The author approaches the topic of how interoperable electronic medical records have the potential to produce better health outcomes while improving the efficiency of healthcare delivery at the same time reducing costs. A series of identified steps to assist a successful transition strategy are discussed as well as how large groups will play a critical role.

Laerum H. Karlsen TH. Faxvaag A. (2004). Use of and attitudes to a hospital information system by medical secretaries, nurses and physicians deprived of the paper-based medical record: A case report. BMC Med Inform Decis Mak. 2004 Oct 16; 4 (1):18.

This report covers the outcome of a case study to determine the frequency of use of a hospital information system (HIS) where the paper-based medical records are scanned and eliminated. The study

involved questionnaires and interviews designed to assess and compare the frequency of use of the HIS for essential tasks, task performance and user satisfaction among medical secretaries, nurses and physicians. Conclusions show that replacing the paper record primarily benefited the medical secretaries whereas the benefit to nurses and physicians appeared less.

Likourezos A. Chalfin DB. Murphy DG. Sommer B. Darey K. Davidson SJ. (2004). Physician and nurse satisfaction with an Electronic Medical Record System. Journal of Emergency Medicine. 2004 Nov;27 (4): 419-24.

This paper covers an assessment of physician and nurse satisfaction after the implementation of an Emergency Department EMR in a large urban teaching hospital. A survey of physicians and nurses included computer background and experience, perceptions regarding EMR use, and concerns about the impact upon quality of patient care. Although the physicians found the EMR easy to use and were generally satisfied they reported that they thought the EMR had no positive impact on patient care. Some confusion was reported in following the sequence of screens, concern about the time it took to use the EMR and the confidentiality of patient information. The researchers reported similar results between the physicians and nurses.

Lunney M. Delaney C. Duffy M. Moorhead S. Welton J. (2005). Advocating for Standardised Nursing Languages in Electronic Health records. Journal of Nursing Administration. 2005 Jan;35 (1): 1-3.

Authors discuss the importance of nursing contributions to the establishment of an EHR, outlining the advantages to nurses using standardised nursing language. They advocate that nurses must rise to the challenge and acquire software from vendors that include the ANA- recognised nursing language or can accommodate one or more of these languages. Concluding that to take advantage of the capabilities of an EHR healthcare facilities need to include recognised nursing languages in clinical documentation software.

Mantas J. (2002). Electronic health record. Studies in Health Technology & Informatics. 65:250-7, 2002.

The EHR is compared with traditional handwritten health records. A definition of electronic health records and associated terminology, classification and coding is presented. EHR architecture and strategic approaches to designing supporting systems are also discussed along with the current state of implementation including obstacles for further implementation.

McConnell H. (2004). International efforts in implementing national health information infrastructure and electronic health records. World Hospitals & Health Services. 40(1):33-7, 39-40, 50-2, 2004.

The author addresses the issue of how many countries are developing national strategies using information and communication technologies to implement health information infrastructure and electronic health records. This paper looks at some national initiatives as well as challenges presented by different approaches around the world and reviews the many organizations looking at international standards relating to eHealth and the implementation of EHRs.

McLane S. (2005). Designing an EMR Planning Process Based on Staff Attitudes Toward and Opinions About Computers in Healthcare. Comput Inform Nurs. 2005 Mar-Apr;23(2):85-92.

This paper discusses electronic medical record systems noting studies documenting nursing satisfaction with the EMR, benefits of an EMR, implementation barriers, user acceptance, the importance of staff buy-in, and the importance of attitudes toward and expectations from user by-in. The author also notes that data collected from an EMR containing rich, accurate documentation of nursing interventions and patient responses support evidence-based practice changes and documents care provided by nurses.

Munir S. Boaden R. (2001). Patient empowerment and the electronic health record. Medinfo. 10 (Pt 1):663-5, 2001.

This article reports on a random sample of patients viewing and controlling their electronic health record at the Hatfield Medical Centre, Derbyshire, UK. The researchers investigated the nature and scope of demand from patients empowered in terms of their own health and viewing their electronic health record. Researchers found that the majority of patients wanted to view their health records but preferred the paper record to the EHR and a significant number of patients did not want to control their own health record. Demographic variables such as age and level of education had a significant impact on the patient controlling and viewing their own health records.

Powell J. (2005). Electronic Health Records Should Support Clinical Research. Journal of Medical Internet Research. 2005; 7 (1): e4)doi:10.2196/jmir.7.1.e4.

The author addresses the issue of the use of electronic health records in research and how this aspect of the EHR has received little attention. Benefits are enumerated which range from systematically generated hypotheses to undertaking entire studies using electronic health record data. He also highlights the fact that both clinicians and patients must have confidence in the confidentiality and security arrangements for the uses of secondary data.

Sprague L. (2004). Electronic health records: How close? How far to go? NHPF Issue Brief. (800): 1-17, 2004 Sep 29.

The author examines the central role in health information technology of the electronic health record and the extent EHRs are used and the initiatives designed to increase that use. Barriers to implementation and widespread adoption are also explored with particular attention to cost, physician resistance, standards and legal issues.

Trpisovsky T. (2004). Electronic health records on cards. Studies in Health Technology & Informatics. 2004; 103: 459-62.

In this article the author presents a brief evaluation of smart card technology with regard to implementing EHRs. Activities currently underway in Europe are covered along with basic standards and recommendations with strongly perceived international harmonisation and interoperability.

Walsh SH. (2004). The clinician's perspective on electronic health records and how they can affect patient care. British Medical Journal. 328: 1184-1187. doi: 10.1136/bmj.328.7449.1184.

In this article the author examines important lessons learned from attempts to get clinicians to use computers in healthcare and how clinicians actually work. Discussion covers the use of narratives in clinical reasoning, the impact of the construction of the patient record on clinical insight and how constructing the electronic record affects clinical insight. Problems in entering data are also covered along with the need for easy access and future challenges discussed.

Wood Jt 3rd. Aceves R. (2005). Five steps to electronic health record success. Health Financial Management. 2005 Jan;59 (1): 56-61.

This article covers five important steps to implementing an EHR – including defining the EHR, setting appropriate expectations, carefully choosing the technology, and carefully planning the transition from paper records to electronic ones.

General Practice, Primary and Ambulatory Care Aspects of EHRs

Kay JD. Nurse D. Bountis C. Paddon K. (2004). The Oxford Clinical Intranet: providing clinicians with access to patient records and multiple knowledge bases with Internet technology. Studies in Health Technology & Informatics. 2004; 100: 130-8.

This paper describes the Oxford Clinical Intranet which provides clinicians in primary and secondary care across Oxfordshire with access to information about their patients held on multiple remote

disparate computer systems, including admissions and episodes, laboratory medical reports, radiology reports and hospital discharge letter. The authors note that the intranet was developed at low cost and the approach appears to be transferable across systems and organisations.

Merrell RC. Merriam N. Doarn C. (2004). Information support for the ambulant health worker. Telemed J E Health 2004 Winter; 10 (4): 432-6.

This paper describes how19 medical students evaluated 2700 patients in four villages in Kenya where there was no power or telephone. A model of information support including personal digital assistants (PDA), electronic medical records (EMR), satellite telecommunications, medical software and solar power was used. The students found the advantage of PDA over paper and by using software for decision support and interacting with the EMR data for medical expertise only a few live telemedicine consultations were needed. The authors concluded that the cost of this information support was low (US 0.28 dollars) per patient and that resources can be provided in remote environments at reasonable cost.

Pyper C. Amery J. Watson M. Crook C. (2004). Access to electronic health records in primary care – a survey of patients' views. Medical Science Monitor. 10 (11):SR17-22, 2004 Nov.

With plans to move to electronic access for health records by the National Health Service (NHS) in the UK there was an identified need to involve patients in the development process. This study aimed at exploring the views of a large sample of patients about online access to electronic patient records (EPR) and health information in primary care. Areas covered in the study included accuracy rights to access, security, confidentiality and smart cards. The results of the study are presented and the authors concluded that it is essential that patients are involved, and their views taken into consideration, at every stage of the development of EPRs.

Legal – Access, Privacy and Confidentiality Aspects of EHRs

Barber B. (2002). The protection of individuals by protecting medical data in EHRs. Studies in Health Technology & Informatics. 87:38-43, 2002.

The author discusses changes in the delivery of healthcare and how individuals need to be protected by protecting their electronic health records. Security issues and data protection need to be taken seriously and health information professionals need a code of ethics to ensure security is maintained.

France FH. Beguin C. van Breugel R. Piret C. (2000). Long term preservation of electronic health records. Recommendations in a large teaching hospital in Belgium. Studies in Health Technology & Informatics. 77: 632-6, 2000.

This article discusses how health records should be readily accessed by authorised persons for patient care and legal security during a patient's lifetime and afterwards for research and teaching. The preservation of health information in a large teaching hospital in Belgium is discussed with two recommendations: the first, that after the patient is discharged all his or her health information should be managed by a unique organisation that has the facility to update regular accesses to all data bases about the patient. Health archives should be formatted using XML (Extensible Mark up Language) software on supports such as DVD-ROM to be upgraded and updated when needed. The second recommendation suggests the use of Computer Output Microfilm (COM) and scanners for non electronic data to be preserved.

Gritzalis S. (2004). Enhancing privacy and data protection in electronic medical environments. Journal of Medical Systems 2004 Dec: 28 (6): 535-47.

The need to raise awareness and provide guidance to on-line data protection is discussed together with the equally important issue of applying privacy-related legislation in a coherent and coordinated way. The issue of patient profiles that reveal sensitive information is highlighted and focuses on countermeasures that can be employed to protect the privacy of personal and medical data transmitted during electronic medical transactions.

Pharow P. Blobel B. (2005). Electronic signatures for long-lasting storage purposes in electronic archives. International Journal of Medical Informatics. 2005 Mar: 74 (2-4): 279-87.

This paper highlights the importance of electronic signatures based on asymmetric cryptography as a means of securing the integrity of a message or file as well as for accountability purposes. The authors also explain how electronic signatures along with certified time stamps or time signatures are especially important for long-life storage not only for electronic health records but also for electronic archives. In addition, they identify mechanisms of re-signing and re-stamping data items, file messages, sets of archival items or documents, and whole archives.

Ruotsalainen P. (2004). Security requirements in EHR systems and archives. Studies in Health Technology & Informatics. 2004; 103: 453-8).

This paper addresses security issues relating to EHRs and electronic archives and proposes that inside a security domain both the archive and the electronic health record system must have a common security policy. In addition, the author comments that the archiving organisation

should have a documented policy for information preservation and also a policy for access and distribution of information between other archives.

Ueckert FK. Prokosch HU. (2002). Implementing security and access control mechanisms for an electronic healthcare record. Proceeding / AMIA. Annual Symposium: 825-9, 2002.

This article covers the use of personal electronic health records, patient empowerment and the patient's control over their personal health information. Critical requirements and access management in relation to data security and mechanisms to provide secure data storage, communication and flexible access management are also discussed.

Some useful web sites:

American Health Information Management Association (AHIMA):
http://www.ahima.org

American Hospital Association:
http://www.aha.org

American Medical Association:
http://www.ama-assn.org

Australian Department of Health and Aging:
http://www.health.gov.au/healthconnect
Australian National Telehealth Plan:
http://www.health.gov.au/healthonline/telehealth.htm

Journal of the American Medical Association JAMA):
http://www.ama.assn.org.public/journal/jama/jamahome.htm

Journal of the American Medical Informatics Association:
http://www.World Health Association: http://www.who.ch/

Glossary of terms:

Audit Trail:	A programme that records access and/or action that occurs in a computer record by logging the user identification, recording date and time of access and action carried out.
Backup:	The creation of a second copy of records or information in case the original is lost or damaged.
Clinician:	All health professionals who provide care directly to a patient – doctors, nurses, physical therapists, occupational therapists, etc.
Confidentiality:	The act of limiting disclosure of private information.
Consumer:	A recipient of healthcare such as the patient.
Cost-benefit Analysis:	A comparison of costs against benefits to determine the long-term value of the proposed system.
Cryptography:	Mathematical functions that transform intelligible data into seemingly unintelligible data and back again.
Data:	A collection of numbers, characters or facts that are gathered according to some perceived need for analysis.
Database:	A file structure that supports the storage of data in an organised fashion and allows data retrieved as meaningful information.
Data Integrity:	The ability to collect, store and retrieve correct, complete and current data so that it is available to authorised users when needed.
Data Set:	A group of data elements relevant for a particular use.
Data Structure:	How data is stored, as in a file, a database, a data repository, etc.

Decision – support Systems:	Programs that organise information to aid decision-making related to patient care or administrative issues.
Digital Signature:	A scanned image of a written signature.
Document Imaging:	Involves scanning paper records to computer disks or other media to facilitate storage and handling.
Electronic Signature:	A means to authenticate a computer-generated document through a code or digital signature that is unique to each authorised system user.
Encryption:	The use of mathematical formulas to code messages.
Evidence-based medicine:	Clinical decision support based on evidence of best practice.
Extranet:	A network that sits outside the protected internal network of an institution by outsiders and uses Internet software and communication protocols for use by suppliers or customers.
Gantt Chart:	A graphic tool used to plot tasks in Management.
Goal:	An open-ended statement describing what is to be accomplished
Go-live:	The process of starting to use the information system.
Health Information:	Healthcare data that has been organised into a meaningful format.
Health Information System:	A system that integrates data collection, processing, reporting, and the use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services (WHO 2004).
Health Level 7 (HL7):	A standards organisation which develops standards for the exchange of clinical data between information systems by means of an extensive set of rules that apply to all data sent. The standards are also referred to as HL7.
Health Practitioner:	See 'Clinician'

Infrastructure:	The underlying framework of a computer system that processes data and information.
Integration:	The process by which different information systems are able to exchange data in a fashion that is seamless to the end user.
Interface:	A computer system that tells two different systems how to exchange data.
Interoperability:	The ability for systems to work together.
Intranet:	A computer network using Internet protocols and technologies to facilitate collaborative data sharing.
Longitudinal:	To reflect the entire history of an individual across his or her lifetime, including data from multiple users.
Mapping:	The process where terms defined in one system are associated with comparable terms in another system.
Messaging Standards:	Standard protocols that assist in the exchange of data between two separate systems.
Multimedia:	Presentations that combine text, voice or sound, still or video images as well as supporting hardware and software.
Network:	A combination of hardware and software that allows communication and electronic transfer of information between computers.
Optical Character Recognition (OCR):	The technology of reading text by electronic means and converting it to data.
Password:	An alpha-numeric code required for access and use of some computers or information systems as a security measure against unauthorised use.
Personal Health Record:	A record maintained by or for direct patient access.
Point-of-Care System:	A computer system that captures data at the location where healthcare is provided.

Practitioner:	Healthcare professional such as doctor, nurse, physical therapist etc.
Providers:	Care givers – a term used to refer to clinicians or the healthcare institution providing healthcare.
Real Time:	The processing of data that takes place at the time an event occurs.
Retention:	The maintenance and preservation of information.
Smart Card:	A storage device resembling a plastic credit card containing patient information.
SNOMED:	Systematized Nomenclature of Human and Veterinary Medicine – a comprehensive clinical vocabulary.
Standard:	A specimen or specification by which something may be tested or measured.
Strategic Planning:	The development of a comprehensive long-range plan for guiding activities and operations of an organisation.
Structured data:	Data that follows a prescribed format.
Unique Patient Identifier:	A single, universal identifier for patient health information that ensures availability of all data associated with a particular person.
Unstructured Data:	Data that does not follow a prescribed format such as may be seen in narrative recording.
Validity:	The extent to which data measures what it purports to measure.
Voice Recognition:	Technology using voice patterns to allow computers to record voice and automatically translate it into written language in real time
Work-flow:	The sequence of actions applied to a process to achieve a result; typically crosses organisational units or different steps taken by the same user.

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Western Pacific Region

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