ELECTRONIC MEDICAL RECORD
(EMR)

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"I admit that to have read this report and it has follow the scope and qualify in Partial Fulfillment of requirements for the Degree of Bachelor of Electronic Engineering (Computer Engineering)"

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DECLARATION

"I admitted that this reports is my own works except for the sentences or phrases that I have states its sources"

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ABSTRACT

The main purpose of this project is to built electronic medical record system which is user friendly and multifunctional. Beside that this system also will be added with new features that current system did not have. The electronic medical record system can be use to record all the data related to the patient who come for the treatment. The objective of this project is to add new features to the current system which are Electro Cardio Graph (ECG) and X-Ray image. By using this system the doctor can easily know their patient's condition whenever they are in the hospital. Beside that lab reports can be given easily without wasting a lot of time. The electronic medical record system use the Visual Basic software and Microsoft Access, where the Microsoft Access is use as a database for the Visual Basic.

ABSTRAK

Projek ini bertujuan membina satu sistem rekod perubatan elektronik yang mesra pengguna dan mempunyai pelbagai fungsi. Disamping itu juga sistem ini akan ditambah dengan ciri-ciri baru yang tiada pada sistem yang sedia ada. Rekod perubatan elektronik digunakan untuk merekod segala data yang berkaitan dengan pesakit yang datang untuk membuat rawatan. Objektif utama projek ini adalah menambah ciri-ciri baru iaitu *electro cardio graph* (ECG) dan gambar X-Ray. Sistem ini membolehkan doktor mengetahui keadaan pesakit dimana sahaja di dalam kawasan hospital, selain itu segala laporan makmal dapat diberikan dengan mudah tanpa menggunakan masa yang banyak. Sistem rekod perubatan elektronik ini menggunakan perisian *Visual Basic* (VB) dan *Microsoft Access* dimana *Microsoft Access* digunakan untuk pangkalan data kepada *Visual Basic*.

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CHAPTER 1

INTRODUCTION

1.1 THE ELECTRONIC MEDICAL RECORD (EMR)

The electronic medical record is a system that record all the patient information as identifiable material, laboratory and imaging records and reports, Electro Cardio Graph (ECG) data, printouts from monitoring equipment, written report and etc. By using this system all of the patient information will be easy to store. This system will eliminate time spent looking for lost data, more comprehensive documentation in less time and doctors can view patient data where and when they are needed. EMR systems improve the quality of patient care and decrease medical errors, but their financial effects have not been as well documented.

There are a two primary categories of the EMR; the "born digital" record and the scanned/imaged record.The "born digital" record, which is information captured in a native electronic format originally is information that may be entered into a database, transcribed from an electronic tablet or notebook personal computer (PC), or in some other manner captured from its inception

electronically. The information is then transferred to a server or other host environment, where it is stored electronically.

The second category are records originally produced in a paper or other hardcopy form (x-ray film, photographs, etc.) that have been scanned or imaged and converted to a digital form. These records are best described as "digital format records", as their content is not able to be modified or altered (with the exception of the use of a third party software to make "overlay notations") as electronic records are.

The process involved in conversion of these physical records to EMR is an expensive, time-consuming process, which must be done to exacting standards to ensure exact and accurate capture of the content. Because many of these records involve extensive handwritten content, some of which may have been generated by any number of healthcare professionals over the life span of the patient, there exists a high probability of some of the content being illegible following conversion. In addition, the material may exist in any number of formats, sizes, media types and qualities, which further complicates accurate conversion. Consideration should be given to developing a procedure to sample and verify images at a high ratio to determine the accuracy and usability of the scanned images prior to disposal of the physical records, if they are disposed of at all.

Further, all electronic repositories of information are subject to the need for periodic conversion and migration to ensure the formats they were captured in remain accessible over the life of the patient, and in some cases beyond, to the expected life of their heirs. Additionally, those responsible for the management of the EMR are responsible to see the hardware, software (applications) and media used to manage the information remain viable and are not subject to obsolecense or degradation. This will require generation of backup copies of the data and protection being provided to these copies in the event of damage to the primary repository. It will also require the planned periodic migration of

information to address concerns of media degradation from use. These are all costly, time consuming processes that must be planned and budgeted for when making decisions to convert physical medical records to digital formats.

1.2 OBJECTIVE AND SCOPE

The purposes of this project are to design and develop an EMR which should be user friendly, interactive and multifunction. Otherwise to add new features that did not have in the system that already use. The new features that will be added in this system are Electro Cardio Graph (ECG) and x-ray image. Similar to the current EMR system, the new system will give clinical staff access to records of every patient stay, office visit, lab test or X-ray result. The new system also will include additional information such as images, medications, physician notes and "best practices" for any given diagnosis. Patients also will have access to their medical records and the ability to communicate with their health care providers through a secure, controlled system that also features a range of self-service options, including appointment scheduling, educational materials and bill payment.

. The system has been design by using Microsoft Visual Basic and Microsoft Office Access for the system database.

1.3 PROBLEM STATEMENT

The current EMR system today is not user friendly, interactive and multifunctional, where the patient's growth is not shown in graph form on. The current system also do not included ECG graph, and x-ray image where this features is important in order to know the patient's record.

CHAPTER 2

LITERATURE REVIEW

2.1. A Brief History of the EMR.

Traditionally, all medical records are maintained on paper in large manila binders called "charts." Typically, a patient has several charts, each maintained at a different location. When a patient is admitted to the hospital, whether on a scheduled visit or an unscheduled trip to the emergency room, a chart request is sent to the medical records department via courier or pneumatic tube. Minutes to hours later, the patient's chart would arrive.

During the patient's stay, the chart is his constant companion. Every interview, test, order, or medication that the patient receives is entered into the chart, dated, and signed by the responsible physician, nurse, or therapist. As a patient is moved about the hospital, from ward to X-ray to operating room, the chart accompanies him, often dangling from a specially-designed bracket on the gurney. When the patient leaves the hospital, a "discharge note" is entered into the chart. The chart is then returned to medical records for filing.

Over the past twenty years, medical institutions have increasingly turned to computerization for help managing patient information. Inevitably, the first department to be computerized is Accounts Receivable. After that, the next departments to get computer systems are Radiology, whose task involves keeping track of ten thousand or more X-ray, Computed Tomography (CT), and

ultrasound studies per year, and the Clinical Laboratory, which processes hundreds of blood and fluid specimens each day.

During the late 80s health care institutions made a concerted effort to weld the individual laboratory computers into integrated "clinical information systems." From a single terminal or PC located in the office or hospital ward, health care workers could retrieve all the patients' test results, including blood chemistry, microbiology, radiology, and biopsy reports. By employing transcription services, hospitals and clinics also began to incorporate important parts of the clinical narrative as well. Surgical operative notes and discharge notes started appearing in the clinical information system, as well as capsule summaries of patient's medical problems (problem lists) and lists of their current medications.

When managed care changed the face of medicine in the 90s, the face of the medical record changed as well. The spread of multi-institution "partnerships," "plans," and "alliances" across the countryside made it impractical to shuttle paper charts around. Doctors now had many more patients to see, and less time to do it in. Interviews and physical exams had to be efficient, expedient, and to the point. Leafing through a new patient's chart and trying to figure out the person's current medical issues just wouldn't cut it in this new world. Further, in order to keep costs under control, the medical plans needed to closely monitor doctors to ensure that every patient was receiving only the diagnostic tests and therapeutic interventions appropriate for his medical condition.

The computerization of the medical record has accelerated rapidly in recent years. In many centers, essential medical history such as clinic visits, hospital admission notes, problem lists, allergies, discharge orders, diagnostic tests, labor and delivery records, medications, and even dietary notes are kept in electronic form. When a doctor goes to see a patient, all the most important information is now instantly available on the computer or terminal in neatly

organized, legible, and searchable form. A few health care providers have even taken the next step--abolishing the written record entirely for a system in which doctors and nurses enter notes into the computer directly and sign them with a digital signature. The notes are crunched into a record-oriented format and stored into a large database.

It's important to emphasize, however, that the traditional written chart is far from dead. Most health care systems still use some combination of electronic medical records and paper charts. It may be a decade or more before the written record is gone for good.

The reason for using EMR because:

1. Consistency

The electronic medical record enforces consistency. Every laboratory result, radiology report and progress note follows a standard format. When formats are standardizes, incomplete or anomalous information stands out. Health care provides can spend less time figuring out what the report says and more time thinking about its meaning.

2. Flexibility

The written medical record is strictly a linear affair. Clinic visit notes, lab results, and progress reports are entered in strict chronological order, like the log book of a seagoing vessel. But medicine is anything but linear. Patients often have multiple, unrelated medical conditions. By forcing everything into a linear narrative the traditional paper chart mixes everything up. The story of the patient's fight with heart disease is interrupted by notes from the podiatrist, the dietician, and the dentist.

In reality, the medical record is more like a hypertext document as shown in Figure 2.1 only in electronic form can it be expressed with the clarity and flexibility that it requires. If a clinician is interested in

following the patient's heart disease, she can rearrange the information so that all the cardiologist's notes are together. Nurses can move all the patient's electrocardiograms together to see how they've changed over the past year. Nurses can even extract a single laboratory value, such as the patient's blood potassium level, and have the computer chart it over time.

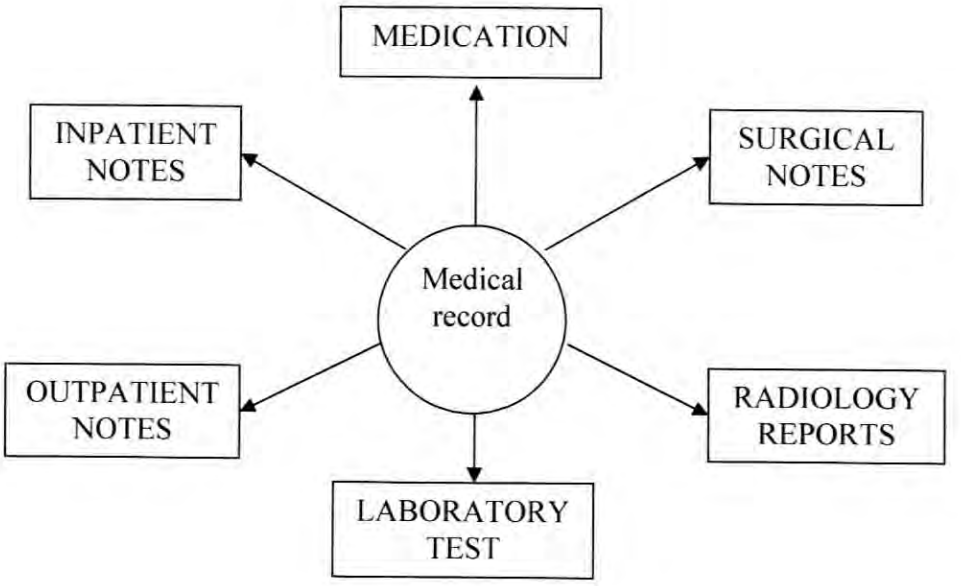

Figure 2.1: Eletronic Medical Record Sources

2.2 Advantages and Disadvantages of EMR

The advantages of EMR are:

1. The electronic medical record never forgets anything. Once the doctor identifies a medical problem, it is never forgotten until it is resolved. This is a huge advantage. Other things that used to be forgotten but won't be any more are medications and their dosages, allergies, (etc cetera).
2. Bad handwriting is no longer an issue. The computer's handwriting is excellent
3. The electronic medical record is available at remote locations.
4. Whereas previously we had stacks and stacks of loose-leaf charts, with wrinkled pieces of paper, some of them torn and falling apart, some of them attached with paper clips, some of them attached with tape, now each doctor just carries around a notebook computer which can bring up all the patient records instantly. There is no longer any need to search through shelves of paper charts.

The disadvantages of EMR are:

1. It takes longer to enter information into the computer than it does to quickly jot down a note on paper. So it's more time-consuming to use a computer.
2. Patients tend to get impatient during the visit, watching the doctor slowly enter the data. It seems to the patient that the doctor is paying more attention to the computer than to the patient.

2.3 Why EMR

1. The need and demand for

    - Timely, accurate health data
    - Rapid sorting of available information
        - Patient-specific data
        - Knowledge bases, decision support tools
    - Information at the point of care
    - Managing patient services

Include in the rationale for widespread implementation of EMR system was a description of the increasing need and demand for timely and accurate health data, the ability to rapidly retrieve and short need data from a large body of available information, including patient data, particularly as the population ages and chronic disease become increasingly common and knowledge bases and other information resources needed to facilitate clinical decision making. Also important is the ability to access information at the point of care, precisely when and where it is needed. The ability to manage patient service and to track the cost and value of services rendered.

2. The need and demand for
    - Tracking costs and value
    - Assessing provider performance
    - Information for research, public health
    - Communicating across distances

- Monitoring patient conditions remotely

In addition, the EMR was also considered important for, accessing the performance of providers, obtaining information needed for research and public healthy activities, for communication information across distance especially given the high mobility of many Americans and the ability to monitor patient conditions remotely and implement treatment decisions at a distance.

2.4 Future of EMR

2.4.1 Physician Factors

- Feeling involved
- Sense of EMR benefits
- Willingness to change habits

Physician, who feel involved in the process and can see how the EMR can support the education, guide reasoning processes, increasing efficiency and improve quality, will be more likely to embrace change and work to develop new and more effective habits. With appropriate institutional support, clinicians can then routinely access and use information technology to facilitate decision-making at the bedside and in examining room.

2.4.2 Institutional Support

- Routine access and use at bedside
- Wireless ubiquitous computing

Once the technology, institutional commitment, clinical leadership and medical staff acceptance all come together, the EMR can truly become more broadly effective tool for improving quality and decreasing cost. As more institutions throughout the country achieve this goal, and work together to share patient data and decision-support tools. The health care superhighway of the future will begin emerge.

2.4.3 Computer and Human Components

- Strong commitment from institutional leaders.
- Physician change agents.
- Commitment and cooperation of medical staff

Getting to this future EMR is vital, but it will not be easy. The technological requirements and expertise needed to install additional computer components of and EMR are already well within reach. However aligning the human components of EMRs and decision-support systems will be a far greater challenge. It will be necessary to get strong commitment from institutional leader who, after reviewing these and similar data, can gain a vision of the role of the electronic medical record in improving quality and decreasing costs. In turn institutional leader will need to enlist the support of physician willing to serve as agents of change, to communicate this vision to the rest of the medical staff, and secure the commitment and cooperation necessary to move the process forward.

2.4.4 A True Information "Superhighway"

The future EMR will travel on a true information "superhighway" where data can flow at high speeds between most providers, health system. Laboratory facilities, public health agencies, and regulatory authorities. Patients will also be able to contribute directly to their own