

The “New” America Electronic Medical Record (EMR)—Design Criteria and Challenge

Ralph Grams

Received: 14 May 2009 / Accepted: 14 May 2009 / Published online: 29 May 2009
© Springer Science + Business Media, LLC 2009

Keywords EHR·Electronic Health Record · HIT·Health Information Technology · EMR design

Introduction

Over the past 40 years the driving forces behind the design of the EMR have been gradually changing. In the 1960s, the leaders in the EMR program were computer programmers and large computer companies such as IBM and Control Data. A complete hospital information system integrated with doctor’s offices was the bridge too far for them. All the major players had a project underway, yet the hardware and software eventually sunk their ship. Medical systems analysts decided what the best flow was for the doctor, and software and hardware dictated the mode of interface. The original medical office system I worked on for Control Data in Maine had a punched paper tape input of the medical record at the doctor’s office which was sent to a central computer in Minneapolis, Minnesota. A large mainframe computer prepared the chart and produced reports for the doctor’s office. These documents were returned by teletype for charting. The system was very slow and cumbersome, and doctors eventually turned it off. It was good for a few press releases, but that was the end of the story.

The next generation of systems focused on hospital based patients. These designs were driven by hospital staff and highly limited by the terminal interface and the speed of the machine. We learned that if the doctors had to wait more than 2–3 seconds to see something on the screen they

would walk away and not come back. The gold standard for all this programming was always the paper medical record.

In the late 1970s, we began to see the entry of billing as a primary motivation for EMR creation. The focus became billing codes and audit parameters that would achieve payment guidelines. The government and insurance carriers were the most important factor in EMR design and this takes us to today where we have a train with no engine. The payers caboose is pushing the train and the engine (doctors) is trapped in the front stuck in reverse. That is a design formula for certain failure and chaos.

The medical record is a unique product of intelligence that comes from a skilled and highly trained individual who is not willing to compromise. Most data driven systems start with low skill clerical input and use tools like bar codes and scanners to capture the raw data. The documentation of medicine is not like Wal-Mart or Home Depot. Patients don’t come with a diagnosis bar coded on their body and their treatment may not be standard or routine because of biological variation.

The physician interface is the key problem facing the EMR and this design problem is the most important factor influencing future success. If the doctor is excited and challenged by the system he sees and it produces income and expedites the care of his patients, then you will see instant as-well-as long-term success. Get the front end right and the rest is already in place to make this process work. Get the front end wrong and the whole process will fail.

This brief editorial will focus on a single question: “What would make a physician want to use an EMR?”

Physician’s finances

The doctor can’t run his office and pay his staff if there is not adequate cash flow. There must be a mechanism that

R. Grams (✉)
College of Medicine, University of Florida,
Gainesville, FL 32610, USA
e-mail: kqinc@aol.com

puts money in the doctor's bank account each day for services rendered that day. This should be as simple as using a credit card and treating each patient's charges as a cash transaction that is paid before discharge from the office. The EMR should make this an automatic function that eliminates additional office staff needed to process claim rejections.

The EMR system should function so well that malpractice premiums can be significantly reduced because the records are constantly audited by in-house as well as external staff from the insurance and governmental agencies. Charge adjustments should have a window of no more than 30 days for audit and approval. This places the burden on the payer to keep the system clean and efficient. There should be a statute of limitation on the ability for a payer to change the chart billing outcome thus providing protection for the doctor from audit harassment.

Medical practice

The flow and application of data into the medical record system must be modernized and expedited. This will take design changes and software upgrades to accomplish. Let's think of the physician as a pilot handling a large commercial aircraft. The designers of the cockpit in these aircraft spend a considerable time studying the human interface and how the pilot can best handle all the jobs he is forced to experience. This creative work has not been done in the EMR world, and we are being held hostage because we have no good working prototypes to offer. Here is where we need to look at the job and its needs for future enhancements. Let's explore eight areas of operational design to begin to set some benchmarks for improvement: preparation, encounter, data capture, decision-support, follow-up, remote interaction, and self-audit.

Preparation

Before a physician begins to evaluate a patient he must have access to a base of knowledge that summarizes the current status of the patient. In its earliest form, Dr. Larry Weed called this his problem list. The EMR must offer a one page summary screen that is graphical and highly interactive that allows the total content of medical knowledge about a patient to be displayed. The design of this page is critical to the ability of the system to expedite care. With modern computer software there should be three dimensional tools that allow the physician to instantly navigate a whole range of issues in seconds. I would equate this to a heads-up display in the cockpit. This needs to have intelligence built into the display so that the practice pattern of the physician can be incorporated into the presentation sequence. It would also

be useful to have a verbal command system to control the display sequence.

Encounter

The patient–physician encounter can be designed in several modalities so that the data is collected after the dialogue or during the process. The problem with current systems is that they are essentially blank forms that the physician has to complete. Some vendors offer templates, but these are usually outdated documents that are not frequently updated by experts and have only limited utility. Most companies ask the physicians to write their own templates and that is a job they are not prepared to do with their limited time and resources. These templates are the key to several doors if they are properly done and executed. If these templates were constantly edited by board certified specialists and included educational material that was imbedded at every level of the process, they could serve as the base for continuing medical education. These templates could be linked to audit criteria that are reviewed and certified by payers. This would automate the payment process and essentially eliminate the need for audits. These intelligent templates would include the diagnosis and treatment options allowable and also the range of test modalities approved for evaluation. The exploration and commercial development of this template service would be similar to the publication of a book or journal service to which a physician would subscribe. It is totally irresponsible to expect a practicing physician to write and update his own templates. This is a complex and time consuming job and should be the basis of a whole new industry to support the new EMR products.

Data capture

If you want something done, then somebody is going to need to pay for the service. Data entry, no matter how it is done, is expensive and time consuming. The physician and his office need to be compensated for this service. We have several forms of data entry now and the more natural mode of voice is something that could work very well with an intelligent template format. Voice feedback and intelligent interaction is a desired goal for the future and would be a large area for innovation in the years to come.

Decision-support

The physicians in today's world are involved in a rapidly changing landscape of new knowledge and breakthroughs in medical research. To keep pace with this expanding universe of technology, the EMR must be made a part of this frontier. We need an intelligent support system that

knows differential diagnosis and disease complications. It needs to reason for the physician and be his intelligent assistant. This means that the template system that is created should be expanded with AI tools that apply this knowledge in problem solving tools and techniques. Using a highly structure relational database foundation for medical knowledge, we should be able to prepare some very useful tools that would interact with the physician when needed. The introduction of Wolfram-Alpha is perhaps the first round of what will be a future age of intelligent medical reasoning engines that can interact with both the consumer as well as the doctor.

Follow-up

The EMR of the future must be proactive in follow-up and patient interaction. Is the patient filing his prescription? Does he/she make their appointments? Did the lab work get done? There are a variety of tasks that need to be designed into the template format that would both guide and direct the physician into appropriate care actions. It is not enough to merely get the data into the system and pay the bill. We need results that relate to the money paid for services. We need to hear from the patient if the drugs are not working or things are getting worse. The physician and his staff do not get paid for this activity and there is a need for an automated and personal touch in this follow-up process. Perhaps here is a role for a new industry that monitors aftercare results and optimizes care treatment plans. This service should be an advocate of the patient to minimize expense and maximize outcome.

Remote operation

The EMR of the future must be mobile. When the physician is at home he must have the same access tools that he has at the office. The navigation screens and all the decision-support capabilities must be remotely operational so that his medical decisions can be made with full knowledge of all the facts.

Self-audit

The EMR of the future must protect the physician and patient from needless mistakes and errors. The system should conduct self audits to make sure that digital records are secure and accurate. The templates will serve as the source for this intelligent review and those patients that are not doing well should be the target of a second opinion and physician oversight. We could eliminate a good deal of medical malpractice if we had these internal audits being run in the background so that physicians could be warned in advance that problems exist. Using these tools, the payers could also audit the available records and look for patients that are not making progress to their satisfaction. There are a host of tools that could be developed in this area to maximize system efficiency and minimize physician irritation and litigation.

Summary

As you can see from a review of the physician interface, there are many exciting potentials that exist for the future of the EMR. None of these will happen unless we change the focus of the system design process and start by making the physician a key and primary player in this equation. To get a proactive physician following is the most important step forward and should be a primary focus for the large investments that are planned. We need a company or organization that sees the need for a future product that will accomplish these goals. We need funding for that process and a prototype development effort to perfect the design. We need the construction of a relational database of medicine with a professional staff to support its operation.

Are there entrepreneurs still out there that can see this challenge and are willing to invest in its accomplishment? I sure hope so and I would be delighted to hear from you by email. Please send your comments and critique to: kqinc@aol.com.