Improving EHR Functionality

Date: Thursday, July 18, 2013; 1 pm

Location: National Institute of Standards and Technology (NIST)
Bldg. 101, Lecture Room B, Gaithersburg, MD

Speaker: James Cimino, MD, Chief, Laboratory for Informatics Development, NIH Clinical Center

Background

James Cimino's primary research interests include medical concept representation and using it to support clinical decision-making. After early work on the diagnostic decision support system DXplain and pioneering work on the National Library of Medicine's (NLM) Unified Medical Language System, he worked for 20 years at Columbia University building clinical information systems, including early Web-based, personal, and mobile electronic health records (EHRs). These systems served as research platforms for clinical decision support, including "infobuttons", a term he coined in the mid-1990's.

In 2008, he moved to the NIH Clinical Center and the NLM, where he continues to practice medicine, teach informatics and build clinical information systems, now with a focus on clinical research. As the Chief of the Laboratory for Clinical Informatics Development, his major project is the construction of the NIH's Biomedical Translational Research Information Systems (BTRIS), which provides NIH researchers with an integrated view of their own research data and the ability to reuse the data of others to answer new questions.

Dr. Cimino's talk addressed the evolution of EHRs, how that evolution is hindering patient care and clinical research, and offered some suggestions for improvement.

Overview

In 1863, Florence Nightingale, wrote about her frustration with her lack of access to good medical records and that her care could be greatly improved if she had such access.

Exactly one century later in 1963, the Life Sciences Panel of the President's Science Advisory Committee said, "We recommend the establishment of a special standing committee…to guide the development of a general purpose health record system… "

In 1968, Larry Weed authored a special article that appeared in the New England Journal of Medicine. **"Medical Records That Guide and Teach"** proposed that each medical record

should have a complete list of all the patient's problems, including both clearly established diagnoses and all other unexplained findings that are not yet clear manifestations of a specific diagnosis, such as abnormal physical findings or symptoms. Weed called for careful analysis and follow-through on each problem as revealed in the titled progress notes, requiring that the proper data be collected and that the conclusions drawn from this data are logical and relevant.

Weed's expressed these concepts as the "problem-oriented medical record" where each medical problem was identified separately. Progress notes are to follow the format of Subjective / Objective / Assessment / Plan, referred to as the "SOAP note". Both problem-oriented medical records and SOAP notes are widely used today.

Given this strong foundation in the written medical record, it is of interest to note that the first aspect of the patient's hospital experience to be put into an automated system was not a clinical aspect per se but instead was used for patient and third party billing.

The second component that was added to most hospital information systems was clinical laboratory results. Frequently this has been followed by the addition of an automated order entry system. Another component has been an alerting and reminder system most often dealing with potential drug interactions.

In the mid-1990's Dr. Cimino coined the term "infobutton". An infobutton allows the system to anticipate physicians' needs and to allow queries [figure 1]. Yet even with the addition of this clinical functionality, today's electronic medical record has more of the look and feel of a spruced up "horseless carriage" [figures 2 vs. 3]. "On a really good day, you might be able to call the system mediocre, but most of the time, it's lousy," says Michael Callaham, the chairman of the department of emergency medicine at the University of California, San Francisco Medical Center.

Despite all of the features currently in an EHR, there is no direct connection between it and the SOAP notes that the physician writes de novo to record patient progress [figure 4]. A desired EHR system would interface with both mobile and home devices. It would provide for the systematic, consistent discrete data capture for the purposes of "learning from every patient". It would enable the smart inclusion of relevant data into notes.

Also feasible in the short term are better views of the record for both the physician and the patient. Disease-specific patient-oriented summaries and medication timelines are just a few of the features that could be provided. These features are shown schematically in figure 5.

The development of analytical tools and their interfacing with the EHR can allow for the re-use of EHR data for better decision support. Such a system uses a clinical data warehouse to improve alerts and allows for risk-stratification with risk-specific plans of care. It raises

Figure 1 – An infobutton

Figure 2 – An early "horseless carriage"
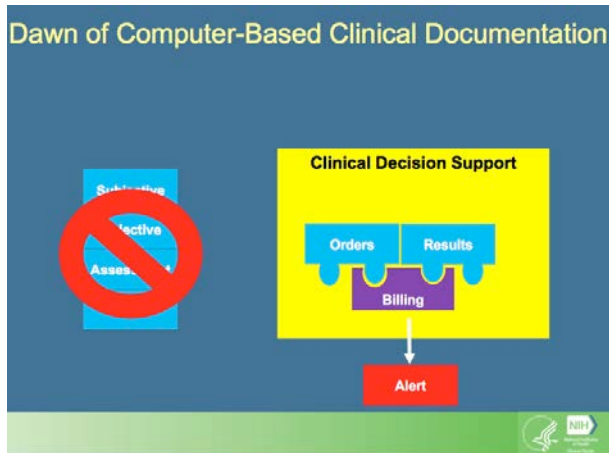

Figure 3 – A later version
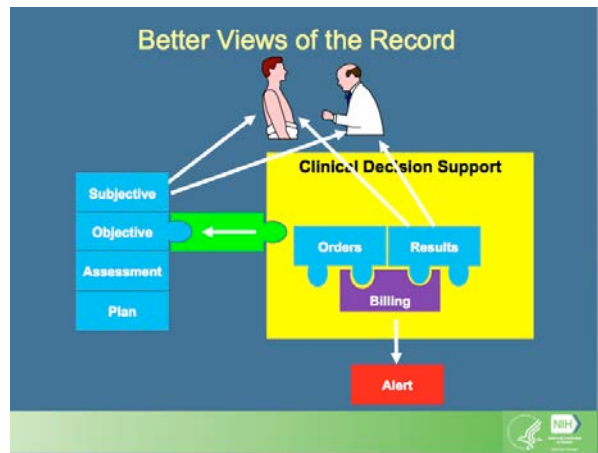
Figure 4 – Current EHRs

Figure 5 – An improved EHR

clinical alerts based unusual patient care.

Tools can be built to interface with EHRs to enable their better reuse for research. These tools would generate alerts for subject recruitment and alerts for protocol violation. As the Chief of the Laboratory for Clinical Informatics Development at the NIH Clinical Center, Dr. Cimino has applied his EHR expertise to the construction of such a tool. The NIH's Biomedical Translational Research Information Systems (BTRIS), which Dr. Cimino has built, provides NIH researchers with an integrated view of their own research data and the ability to reuse the data of others to answer new questions.

We still have a quite a way to go in the development of EHRs in order to make the computer a full partner with the physician. Dr. Cimino's vision of this is shown in figure 6.
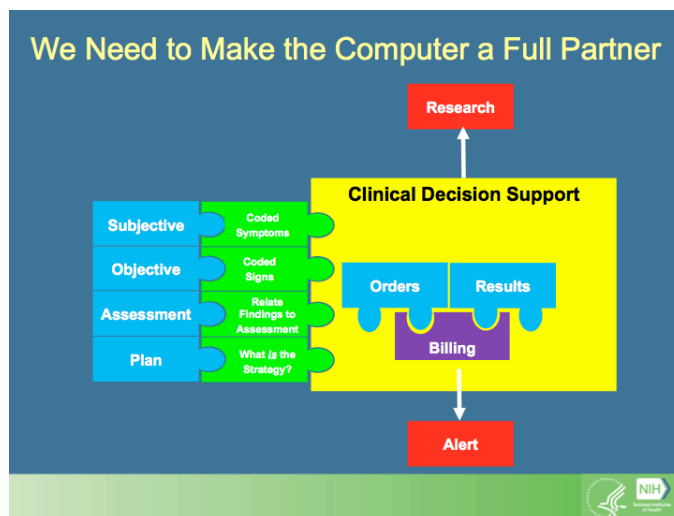

Figure 6 – Schematic of an EHR that shows a full partnership between the computer and the physician

Such a fully functional EHR is possible. Elements of a fully functional EHR have been built and are currently being used at Partners Healthcare, Harvard University, Columbia University, Vanderbilt University and the Regenstrief Institute.

Dr. Cimino finished his presentation with another quote from Larry Weed.

"It has been said that preoccupation with the medical record and the computer leads to neglect of the "humanitarian" side and the 'art' of medical practice. The most humanitarian thing a physician can do is to precisely know what he is doing, and make the patient as comfortable as he can in the face of problems that he cannot yet solve."