

A Critical Pathway for Electronic Medical Record Selection

Anne Holbrook, MD, PharmD, MSc^{1,2}, Karim Keshavjee, MSc, MD¹,
Karl Langton, MSc¹, Sue Troyan, RT¹, Susan Millar¹, Sonny Olatunji¹,
Mike Pray, MD³, Rick Tytus, MD³, Peter T. Ford, MD³, for COMPETE Study Group.
Centre for Evaluation of Medicines, St Joseph's Hospital¹; Division of Clinical
Pharmacology, Department of Medicine²; Hamilton-Wentworth Family Medicine Inc.³

Abstract

Electronic medical records (EMRs) are increasingly becoming a necessary tool in health care. Given their potential to influence every aspect of health care, there has been surprisingly little rigorous research applied to this important piece of emerging health technology. An initial phase of the COMPETE study, which is examining the impact of EMRs on efficiency, quality of care and privacy concerns, involved a rigorous "critical pathway" approach to EMR selection for the study. A multidisciplinary team with clinical, technical and research expertise led an 8-stage evaluation process with direct input from user physicians at each stage. An iterative sequence of review of EMR specifications and features, live product demonstrations, site visits, and negotiations with vendors led to a progressive narrowing of the field of eligible EMR systems. Final scoring was based on 3 main themes of clinical usability, data quality and support/vendor issues. We believe that a rigorous, multidisciplinary process such as this is required to maximize success of any EMR implementation project.

Introduction

As health care becomes ever more complex, integrated, fast paced, community based and quality demanding, electronic medical records (EMRs) are becoming standard office equipment. Potential advantages over current paper-based offices include faster, portable and more reliable access to charts, instantaneous access to decision support from the simple (drug interaction flags) to the complex (patient specific messages re: prescribing recommendations), ability to rapidly formulate patient summaries for referrals and letters, integration of laboratory and pharmacy data directly into the patient record, ability to query the practice population to support preventive health manoeuvres or research, and tighter security.^{<1,2>} An early phase of the COMPETE (Computerization of Medical Practices for the Enhancement of Therapeutic Efficacy) study, which is evaluating

the validity of many of these claimed advantages in primary care, involved the development and application of a rigorous EMR software assessment process. This degree of rigor applied to EMR selection has not previously been described in the literature.

Methods

A literature review of MEDLINE and HealthSTAR from inception to September 2000 using keywords "medical records systems, computerized" as MESH heading and "selection" as text word yielded no relevant hits. Neither a rigorous selection process for EMR software for any setting nor a discussion of EMR software selection issues in primary care was found. Therefore a software selection team, comprised of technical, clinical and research methodology expertise was assembled to carry out all phases of the subsequent evaluation. Specifically, team members combined expertise in the assessment of hardware and software, database and network configurations, user interface, feasibility in primary care, EMR content and research methodology. The main working premises of the group included the following:

1. The "average" Ontario family physician in solo or small group fee-for-service community practice, is the gatekeeper for all health services, does not personally use a computer in the office (<5% using EMR in practice) and sees 25 to 60 patients per day. Virtually all physicians bill for services electronically.
2. EMR data architecture is a key variable. Since COMPETE is examining clinical outcomes, utilization and processes of care, standard database designs with coded data are preferable to text entry EMRs.
3. Physician usability of the EMR is a major issue. Interfaces inhibiting speedy, intuitive, flexible charting are likely to fail.
4. Measures to protect patient privacy are essential.

5. The selected EMR software must be compatible with provincial and national health care developments.

At this point, a multi-staged evaluation was planned and executed. The stages are summarized in Table 1 and are described as follows:

1. Surveys and focus groups with local family physicians regarding:
 - a. *determinants of interest* in EMR and *barriers* to participate,
 - b. *desired functionality* for an EMR and
 - c. *willingness to pay* for an EMR.
2. Development of a *detailed EMR evaluation form*. This was adapted from conference presentations on the merits of specific EMR features. The form itself or the topic domains in the form was used for subsequent stages.
3. A *scan* of medical journals, health technology journals, the Internet, and attendance at EMR conferences for functional and available EMRs. In specific, we sought EMRS that were:
 - a. available for sale in North America as evidenced by advertising,
 - b. functional for outpatient ambulatory care,
 - c. functional beyond solely billing and scheduling (i.e., at least the charting of patient encounters),
 - d. compatible with a Windows operating system.
4. Initial checklist *review of features* of relevant EMRs by two family physicians recruited to serve as pilot sites for the project.
5. A *full day live demonstration* event consisting of:
 - a. Working EMR demonstration by vendors with detailed quantitative review of features by a team of 8 EMR-using clinicians, technical staff and researchers,
 - b. Shorter demonstrations for group of local family physician “peer influentials” with questionnaire feedback on interest in EMRs, demographics of practice, user interface, customizability and overall impression of acceptability in their offices,

- c. An evening “open house” presentation by each of the vendors for all interested area family physicians. Questionnaires solicited comments on each EMR system’s suitability for their practice.

6. *Site visit evaluations* consisting of one user site of the vendor’s choice and the vendor’s headquarters, by clinical and technical team members.
7. An *evaluation of the working copy* of each of the four finalist EMRs by 12 family physicians. These were structured, one-on-one half-day sessions concentrating on charting representative patient encounters.
8. The *evaluation* finals involved the two top EMR systems identified from previous stages and proceeded systematically through 3 phases:
 - a. “expert user” demonstration. Each vendor company identified an experienced, expert family physician user who provided a demonstration of their use of the system (in the absence of vendor personnel),
 - b. collation of all previous evaluation stage ratings into a scoring matrix with three main themes: database, user interface/usage and support issues,
 - c. negotiations in person with vendor personnel regarding compatibility of our research EMR implementation agenda with the vendor’s strategic direction.

Table 1. Stages of Systematic EMR Evaluation

1. Survey of interest, barriers, desired functionality, willingness to pay
2. Development of detailed EMR evaluation form.
3. Broad search for available EMR systems
4. Brief review of features of EMRs
5. Detailed vendor demonstration of EMR features in person
6. Site visits to EMR system user practice and vendor headquarters
7. User evaluation of working copy of EMR using typical case scenarios
8. Finalist evaluations and negotiations

Results

The entire EMR selection process was completed in late 1997. As we proceeded through the early evaluation stages, it became clear that there was a wide range of opinions amongst family physicians about EMRs. Of a study catchment community of approximately 700 family physicians, only 10-15% were sufficiently interested in EMRs to attend information sessions or participate in evaluations. Another 10-20%, generally older physicians, were opposed to using computers for their patient care under any circumstances. Interest in EMRs primarily revolved around the perceived potential to improve office efficiency, improve the quality of charting and access quality of care enhancements such as reminders and guidelines. All physicians named the cost of EMR setup and support as a major barrier to computerizing and many felt that health data privacy concerns and their ability to convince their physician colleagues and staff to computerize were significant impediments.

Although 40 systems advertising themselves as EMR software for North American community primary care settings, fewer than 15 were considered full EMRs capable of supporting a paperless office. Elimination of those not available for sale in Canada or not available for a Windows environment reduced the list to 7 systems. The family physician feature checklist review identified four systems for more detailed evaluation.

The detailed EMR evaluations concentrated on the following domains, each scored quantitatively:

1. Access procedures and security
2. Scheduling and patient demographics
3. Charting an encounter
4. Prescriptions
5. Diagnostics
6. Cumulative patient profile
7. Reports and consults
8. Online literature/knowledge resources
9. Database qualities
10. Health promotion/preventive health
11. Patient resources
12. Communication and productivity aids
13. Other system or company features

By the end of this review, it became obvious that systems with a higher quality database structure necessary to support the research objectives of

the study and the health maintenance/practice query objectives were rated lower for user interface issues than the text-based systems. As well, none of the EMR systems had a large network of installed primary care users.

Visits to user sites were revealing for several reasons. In a large EMR-using practice, only a small minority of physicians used the computer and the rest dictated their notes thus necessitating transcriptionist expense and eliminating any opportunity for real-time clinical decision support. In another teaching family practice, use of the EMR had withered for lack of a physician champion and in-house information technology support. Conversely, practices flourishing with EMRs tended to be solo or small groups where the physician EMR champion was adept with keyboards and was knowledgeable about hardware and software problem solving.

Visits to all vendor sites, while intended to allow our technical team members a full view of the software architecture, instead tended to clarify the tenuous financial situation of the companies. These visits also confirmed that claims made about available features or database quality were frequently exaggerated.

The family physicians, although selected from different practice styles and locations, were consistent with each other in their ratings of working copies of each of the four remaining systems. Three systems were judged to be usable in their practices with training and to have potential to advance their quality of care.

At this point, a re-iteration of the goals and objectives of the project in light of the evaluation process to date was undertaken by the EMR selection team. The working premises developed at the onset were judged to still be highly relevant. In addition, we endorsed our research objective to provide real time, patient-specific clinical decision support to physicians. Only two EMR systems were judged to be potentially capable of this rigour.

At the final evaluation stage, it became clear that trade offs were yet necessary. The software with the more user-friendly interface did not provide the high quality structured database "back end" of its competitor and vice versa. The third domain of evaluation, support issues, did not adequately differentiate between the two

systems. The choice was made based on team consensus scoring of each system in the 3 summary domains plus a subjective evaluation of the finalist vendor presentations in response to our full study proposal. A Canadian system with the structured, extractable database, Pen Windows environment, Ontario billing capacity, and well-developed patient templates was selected.

Discussion

To our knowledge, this is the first description of a systematic, multifaceted, rigorous team approach to EMR selection. We were impressed with the scarcity of literature on this important aspect of health technology assessment. While several articles describe principles or features to consider in EMR selection <1,3-5>, surveys of EMRs <6>, or methods for structured EMR vendor demonstrations <7>, none outline a comprehensive process or "critical pathway" as described here. Given the substantial commitment in time, energy and finances required for physicians to evolve their practices from paper to computer, they should expect to have a critical pathway available for use in evaluating EMRs. It seems odd that far more resources and oversight are applied to less important aspects of health care, for example therapies for short term relief of heartburn, headache or hemorrhoids, problems that are not life threatening, than are applied to systems affecting every aspect of thousands of patients' care every day for the life of the practice. <8>

Several points emerged from our laborious EMR review. First, no perfect system exists. Our anxiety over missing "the optimal EMR" which might be just at the point of release at times overtook our more rational desire to select a system with a user base and led to delays in finalizing our choice. In the end, we spent more than 12 months selecting a software. Second, frequent revisiting of the goals, objectives and premises was helpful to anchor evaluation at each stage, particularly when non-team physicians were involved. Third, each stage of the evaluation raised new issues to be addressed in subsequent stages. For example, the possibility of developing our own software modules, perhaps concentrating on patient problem list, prescriptions and diagnostics only, was raised several times only to be rebuffed by concerns about development time, costs and ongoing support. Both clinical and technical

team members remained dissatisfied with their level of understanding of each product's clinical usability, data retrieval ability and vendor viability until virtually the final selection day. In particular, concern in both groups about exaggerated vendor claims beyond ability to deliver triggered an ever more detailed review of aspects of each system with each stage of evaluation. These concerns were often realized. For example a system promoted as Windows-based turned out to be DOS-based, a system claiming a large user base could not come up with a single family physician user for us to interview, a system claiming excellent database structure turned out not to have a query tool available for physician users, etc. Thus the entire selection process in some respects was a risk management exercise with the goal of decreasing the chances of failure of the project.<9> Fourth, the EMR marketplace is volatile and evolving constantly. Several well-developed U.S.-based EMRs disappeared or merged with competitors and were shelved during the course of our investigation. Thus we were usually evaluating a moving target and vendor stability is still a major concern. Finally, especially ironic to the researchers on the team, our structured, quantitative assessments applied at several stages were often less contributory to our ultimate decision than the subjective, more consensus than evidence-based evaluations.

In summary, we have developed a comprehensive, structured approach to electronic medical record selection. Although our project involves community-based primary care this process is likely transferable to institutional settings. The importance of a multidisciplinary team with commitment to shared goals and objectives for the EMR installation cannot be overemphasized.

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