Introduction to Minitrack:
Information Overload on the Physician’s Desktop

James R Warren

Health Informatics Research Group, School of Computer & Information Science
University of South Australia, Levels Campus
Mawson Lakes SA 5095, AUSTRALIA
warren@cis.unisa.edu.au

Abstract

A growing array of on-line information sources and computer-based decision aids is available to the health care worker, especially the General Practitioner (GP). These systems include medical expert systems, clinical pathways and guidelines, evidence summaries (such as the Cochrane Collaboration), alert/reminder systems, and on-line drug information, as well as the ability to query and display electronic patient records in general. All of these supports are technically feasible to deliver to the point of care (with increasing ease as desktop computing, the Internet, and Web become ubiquitous), however they present as much a problem as an opportunity to the GP who is expected to integrate these tools with their practice.

Twenty-five years of active development has yielded thousands of medical expert systems across the gamut of medical specialties – but models of medical reasoning are not a total solution to successful decision support in medicine. The system must fit the workflow and philosophy of the practitioner. The system must support but not supplant human expertise. More recent work has concentrated on on-line presentation of human-readable guidelines over automated reasoning systems. Evidence-based guidelines of best practice, when linked to patient records to produce automatic reminders, are known to reduce cost and morbidity as are practice guidelines in general if their recommendations are followed. This minitrack addresses the question of how to deliver clinical information to the physician’s desktop such that is acceptable and usable to improve patient care.

1. Introduction

It requires less than the keenest of observers to notice that computers are becoming increasingly ubiquitous in the workplace. It also requires only rudimentary attention to current events to notice all the hype about the World Wide Web, Internet and Information Superhighway. Most people would also be aware of rising health care costs. If living in the United States, you may also have noticed the move to Managed Care (or, to a lesser extent, Shared Care in the UK, Coordinated Care in Australia, or Integrated Care in New Zealand).

Somewhat more specialized knowledge is required to notice the increasing emphasis on evidence as the basis of clinical decision making. With this we see the rise of various sorts of clinical guidelines and (slightly more prescriptive) clinical pathways that purport to represent the “best practice” models based on the evidence of randomized controlled trials (RCTs) and expert opinion. If you are in a medical line of work, you will also notice the availability of numerous desktop computing packages to help manage your practice. There are, for instance, a lot of on-line sources of drug information and prescription writing packages that warn you of adverse drug interactions.

With a somewhat different, but relatively common, form of specialized knowledge, you would note that it is getting a lot easier to develop applications on the computer. For some years, it has been getting easier to make graphical user interfaces with various screen painters and object toolkits, and to integrate these with relational databases. Now what we find is that it is really easy to connect distributed systems through the Internet via all sorts of clever mechanisms like Java and ActiveX that are anywhere from cheap to free. For that matter, if we are not too picky, Web authoring tools will let us do most things without even knowing HTML.

All of these relatively obvious trends come together for a less obvious, unintended, and undesirable effect – the physician has an overwhelming number of on-line information options. While the potential to access vast and diverse sources of on-line information, in and of itself, sounds pretty good, we have reached a point where:
(a) rising costs, respect for evidence and managed care models motivate use of information; and (b) the technology makes it easy to reach this information. Hence, there is an increasing expectation that physicians will in fact avail themselves of the information. The problem is that the sources are uncoordinated and have been produced will little sensitivity to how the doctor might fit them into practice (at least how they might fit them in light of all the other tools they may use as well).

Consider, for instance, the World Wide Web. There’s lots of information there. In addition to materials posted by well-meaning individuals, self-help and support groups, there are Web sites for most major research universities and for their associated university hospitals. There are government and professional-body sponsored reports and repositories (to name one of thousands, http://www.nih.gov). How many GPs (excepting perhaps those in extreme rural conditions) can honestly say it is impracticable for them to acquire a PC, an Internet Service Provider, and a Web browser such that they can exploit the wealth of information on the much vaunted Information Superhighway? The obvious retort to this is that access, per se, is not the issue; putting the information to good clinical use is the issue.

Twenty-five years of active development has yielded thousands of medical expert systems across the gamut of medical specialties, yet they have had minimal impact on the practice of medicine. This does much to prove that models of medical reasoning are not a total solution to successful decision support in medicine. Two deficiencies of traditional expert systems are: (a) integration with an overall clinical workstation environment; and (b) the “Greek Oracle” approach [6] where the expert system provides an answer to the physician who is supposed to simply accept it. The system must fit the workflow and philosophy of the practitioner and support but not supplant human expertise.

More recent work has concentrated on on-line presentation of human-readable clinical information repositories over automated reasoning systems. A notable effort in this vein is the Cochrane Collaboration [2], which electronically publishes systematic, up-to-date reviews of relevant RCTs in health care. Zielstorff [9] suggests that the highest form of guideline is one that is linked with the patient record; that is, the guideline is contextualised. Evidence-based reminders of best practice, when linked to patient records to produce automatic reminders, are known to reduce cost and morbidity (e.g., [4]) as are practice guidelines in general if their recommendations are followed [3].

In terms of providing a delivery mechanism for diverse information sources, Web/Internet technology has been a major boon. Cimino et al. [1] demonstrated the use of Web technology to greatly facilitate integration of data from diverse architectures within a hospital onto a unified clinical workstation. Since then, many hospital and area intranets have sprung up (some are illustrated in the papers of this minitrack). Furthermore, for some time there has been standardization for communication of messages between health care system (e.g., HL7). A step beyond arriving at a standard for messages is to put forth a standard information architecture for the content of the health record itself, and this is undertaken by the Good Electronic Health Record (GEHR) project (http://www.chime.ucl.ac.uk/HealthI/GEHR). CORBAmeld (http://www.omg.org/corbamed) aims for even further integration by providing standard object interfaces that would encompass both data and data processing methods. The net effect of the Web and HL7 now, and efforts such as GEHR and CORBAmeld in the future, is to make it increasingly easy to funnel more clinical information onto the doctor’s desktop workstation.

Superficially, there is no denying the utility of all this information. However, it has been self-reported that clinicians have less than one hour per week available for reading [8]. At what point do they consult these new information sources? For all that is said about the new information sources and decision support tools, much less is said on how to present all this information in a practical way. One initiative I feel is particularly in the right spirit is Lifelines [5] from the University of Maryland Human Computer Interaction Laboratory. Here we see a research direction and related tool particularly for exploring the questions of how to view a complex, long-term patient record. Also exciting is any work that focuses on the integrated presentation of guidelines with the electronic medical record of the case at hand (such as [4] and [7]). As researchers I suggest we assume there are systems in place to feed us with information (including decision rules, guidelines and the like) and move onto the next question: So now what do we do with it all? This minitrack provides a forum to address the question of how to make good clinical use of information on the physician’s desktop computer.

In the first paper, “A New Instrument for Medical Decision Support and Education: The Stanford Health Information Network for Education,” Paul Godin et al. of Stanford University School of Medicine take the exciting approach of integrating decision support with continuing medical education (CME). This directly addresses a number of problems by providing the physician with motivation to use decision support tools via the reward of CME credit and simultaneously engendering the superior learning characteristics inherent in receiving information at the moment of application. The idea is to allow the physician to “flow seamlessly between clinical practice and a learning environment” wherein there is access to clinical alerts and medical literature.
In the second paper, “Intelligent Visualization and Exploration of Time-Oriented Clinical Data”, Yuval Shahar and Cleve Cheng, of the Stanford Medical Informatics group look specifically at the question of representing, processing and visualising the results of clinical observations over time. In particular, Shahar and Cheng focus on deriving higher level concepts regarding time intervals from observations at points in time; for example, their system may recognize a period of anemia or rising blood glucose. Moreover, they combine domain-independent temporal operators with domain-specific clinical knowledge. The approach has particular potential to stave off the information overload physicians may encounter with chronic disease patients.

To finish the first presentation session, Yukio Kurihara et al. of the Kochi Medical School present “Integration of Clinical Images into the Total Hospital Information System.” This paper addresses an important facet of growing on-line information infrastructures: that it is practical to store and access extensive sets of clinical images as well as text and numbers. Handling clinical images is still, however, a challenge to the capabilities of personal computers. Kurihara et al. relate the problems they have encountered, and largely overcome, including issues of user interface, access speed, screen size and grey-scale limitations.

In the second 90-minute presentation session, we lead with “Using an Intranet for Physician Desk Top Data Consolidation,” by Ron Brooks of CGF Health Systems. This paper introduces one of the true megatrends in health information systems today: the use of Intranets and Web technology to provide a flexible, integrated interface to the patient record for both in-house and remote users. The InfoClique system presents a patient-centered user interface and has been particularly handy in supporting data integration across diverse systems that now must communicate due to a merger of health systems in western New York state.

Next, myself and other members of the University of South Australia’s Health Informatics Research Group present “Chronic Disease Coordinated Care Planning: Flexible, Task-Centered Decision Support.” This work, like Brooks’, builds on the megatrend of using the Web/Intranet backbone, but attends particularly to: (a) molding the system around the specific model of care, in this case a Coordinated Care model for chronic illness; and (b) the integration of clinical guidelines with the medical record of the case at hand. Our goal is to build a flexible system that subtly indoctrinates the General Practitioner into the care model recommended by the expert Care Mentor groups, while leaving ample room for the GP’s discretion.

Finally, Rudolf Hanka, Claire O’Brien, and Iain Buchan of University of Cambridge combine with Heather Heathfield of Manchester Metropolitan University to present “WAX Active Library: A Tool to Manage Information Overload.” The WAX system delivers what would, on paper, be a cartful of relevant information to the GP in the form of a collection of hypertextual electronic books (in fact, libraries with shelves of books with pages). Notably, the collection of local and national guidelines and directories is held locally on the doctor’s PC, rather than facing the unpredictable delays of Wide Area Networks, because very rapid access to information is a critical success factor in such a system.

I find it very exciting to see how well the range of desktop clinical information management issues is addressed in the first set of papers for the Information Overload on the Physician’s Desktop minitrack of the first-ever IT in Health Care track of HICSS. Among the problems addressed in this first offering are: chronic care, the role of intranets, doctor education, temporal accumulation of data, multimedia records, and the integration of guidelines with electronic patient records. I have high hopes that this forum can bring into sharp focus the innovations needed to achieve a new level of usability for clinical workstations.

References


