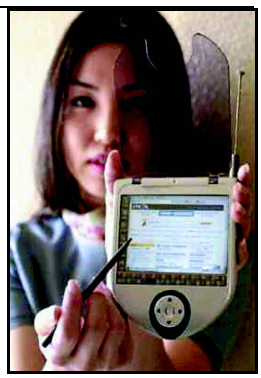
Health informatics



INFORMATICS AIMS TO FIX the "pathologies" in the information systems used to deliver healthcare. If physiology literally means "the logic of life", and pathology is "the logic of disease", then health informatics is the logic of healthcare.[1] It is the rational study of how we think about patients and how treatments are defined, selected and evolved. The tools of informatics are likely to be clinical guidelines, formal medical languages, information systems, or communication systems like the Internet. Our understanding of information system pathologies in healthcare has advanced rapidly over the past decade, with the advent of evidence-based medicine and the focus on error reduction and improvement in the quality and safety of care.

Computer-based prescribing. The most common cause of adverse clinical events is medication error, which accounts for about 19% of adverse events, and the commonest prescribing errors can be redressed by better information about medications or the patients receiving them.[2] About 70% of Australian GPs now prescribe electronically, and it may soon be indefensible to prescribe without computer support. Computer support reduces serious prescribing errors by 55%, and overall prescribing errors by about 83%.[2] Errors are reduced through automated checks for dosage, drug–drug interactions, and appropriateness of indication.

Although the benefit of computer prescribing increases when it is integrated into an electronic patient record system, lack of such record systems is no reason to delay introducing electronic prescribing. The past two years have seen increased activity at a national level in developing standard electronic health records, notably through the Health Connect program <http://www.health.gov.au/healthonline/connect.htm>, but progress towards standard electronic record formats remains slow.

Alerting systems. Alerting systems deliver urgent warnings to clinicians. For example, clinicians can be alerted by health authorities about civil defence matters with health implications, such as bioterrorist attacks, outbreaks of infectious diseases, or medication alerts. Alphanumeric pagers, text-enabled mobile phones, and wireless palmtop computers are all able to receive such messages, allowing clinicians to react rapidly to new information independent of their physical location. Increasingly, such technology is being used to support national emergency "cascade" systems that attempt to contact all clinicians quickly.

Many clinical decisions require revision as new evidence arrives. Computer-generated alerts can also be used to inform clinicians about new information. Alerts may notify clinicians of errors in medication orders, new laboratory results, or changes in the status of patients attached to monitoring equipment. Simple alerts can be generated automatically (eg, by laboratory computer systems) or be sent as emails that get redirected into the alerting system (eg, when a hospital pharmacist detects a medication abnormality during routine patient review).

Computer-generated messages can substantially improve clinical care. When physicians were alerted via email to increases in serum creatinine levels in patients receiving nephrotoxic medications, medications were adjusted or discontinued an average of 21.6 hours earlier than when no email alerts were delivered.[3] When clinicians were paged about "panic" laboratory results, the time to therapy decreased by 11% and the mean time to resolution of an abnormality was 29% shorter.[4]

Continuing medical education. Continuing medical education (CME) can also benefit from new technologies. Traditional didactic measures such as lectures do not substantially change clinical performance or improve clinical care.[5] In contrast, interactive educational activities, structured around actual problems in the clinical workplace, are more successful.[5] Furthermore, clinical science produces information at a rate that far exceeds the capacity of clinicians to read or absorb it.

Because keeping up-to-date as a separate activity is no longer feasible and learning works best in the clinical workplace, most future CME will involve using online information technology to answer immediate clinical questions. Thus, CME changes from periodic knowledge updates to a "just in time" model in which clinicians check the medical knowledge base, potentially at every clinical encounter.

At present, online evidence delivery systems are in their infancy. Systems designed to support the information needs of clinicians have been in development for some years, and should be a routine component of clinical practice before the end of the decade. Current online evidence systems rely on the clinician to be an expert in searching for and identifying appropriate information. Future systems will be able to intelligently seek out the most appropriate information, and present it in a form most suited to the clinical context.

In summary, practising clinicians are likely to see informatics interventions play a larger role in their clinical workplace over the next several years, often in novel and unexpected ways.

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1. Coiera E. Guide to medical informatics, the Internet and telemedicine. London: Arnold, 1997.
2. Bates D, Cohen M, Leape L, et al. Reducing the frequency of errors in medicine using information technology. *J Am Med Inform Assoc* 2001; 8: 301-308.
3. Rind D, Safran C, Phillips RS, et al. Effect of computer-based alerts on the treatment and outcomes of hospitalized patients. *Arch Intern Med* 1994; 154: 1511-1517.
4. Kuperman G, Sittig DF, Shabot M, Teich J. Clinical decision support for hospital and critical care. *J Health Inform Manage Syst Soc* 1999; 13: 81-96.
5. Davis D, Thomson O'Brien MA, Freemantle N, et al. Impact of formal continuing medical education — do conferences, workshops, rounds, and other traditional continuing education activities change physician behaviours or health outcomes? *JAMA* 1999: 282; 867-874. ❑