Impact of E-Prescribing on Antibiotic Use in Australia ICACC 2004, Control Number 107.

Dr. Ken Harvey, School of Public Health, La Trobe University, Australia.

Electronic medication management (E-prescribing) has the potential to improve the prescribing, dispensing and use of antimicrobials (and other drugs).[1] In 1999, the uptake of computers by Australian general practitioners (GPs) was stimulated by the Commonwealth government. They offered a one-off grant of around A$ 10,000.00 to those practices who purchased a computer, acquired internet connectivity (an E-mail address) and promised to use E-prescribing software to write the majority of their prescriptions. This increased the numbers of GPs writing prescriptions with the aid of a computer from around 50% in 1999 to more than 90% in 2004.[2] The government assumed that this initiative would automatically improve prescribing through the production of legible, printed prescriptions, automated drug-allergy and drug-drug interaction checking, and better access to best-practice information including antibiotic and other guidelines.

Legible, printed prescriptions have been one positive outcome of this initiative. However, the introduction of E-prescribing introduced its own problems.

First, new errors were introduced by E-prescribing systems, such as selecting a look-alike but wrong drug from a pick list, prescribing for the wrong patient (because of failure to exit the previous patients' record) and printing doses in a manner that led to dispensing errors (e.g. if the software neglected to print zero before a decimal point).

Second, many GPs simply used the computer as an electronic typewriter and failed to enter key clinical information such as the patient's allergy history. This not only prevented drug-allergy checking but also led to a false sense of security when no allergy alerts were produced.

Third, no performance standards were set, either for the E-prescribing software or the databases upon which the various packages relied (such as drug-drug interactions). The National Prescribing Service tested four popular GP software packages by entering a common set of elderly patients on multiple medications. This revealed very different behaviour by different software packages; some missed serious drug-drug interactions, others produced numerous trivial and clinical unimportant alerts. GPs noted that the latter behaviour caused them to turn off all alerts.[3]

Fourth, one software vendor rapidly became the market leader because its business model relied on pharmaceutical industry promotion to heavily subsidise the cost of purchasing and updating the software. This business model facilitated software uptake but also resulted in advertisements for the latest and most expensive drugs flashing up in the doctor's face at the time of prescribing. In addition, GPs using this software package were shown to prescribe more antibiotics per patient than those who wrote 'scripts manually; it was suggested that this result was due to default settings in the software automatically writing in the maximum number of repeat prescriptions allowed.[4] Another default option in this software, subsequently changed, was the automatic production of a, "do not substitute generic drugs" message on the prescription.

Finally, the inclusion of antibiotic guidelines and other independent therapeutic information into E-prescribing software did not occur because of arguments between software vendors and guideline producers over who should pay and what standards should be used for E-guideline representation and interfacing.

However, the story is not all bleak. The General Practice Research Network (GPRN)[5] has shown that E-prescribing alerts can reduce unnecessary antibiotic use (the message was not to use antibiotics if the diagnosis was influenzae). In addition, the GPRN has shown that the feedback of data collected from E-prescribing software can reduce the use of antibiotics in upper respiratory tract infections when it is compared with antibiotic guidelines recommendations and used for personal reflection and peer group discussion.

In Australian hospitals the uptake of clinical computer systems has lagged behind general practice, partly because of the greater complexity and expense of the systems required, but also because State governments, who are responsible for public hospital funding, have only recently been convinced to invest in this area. Regardless, several stand-alone electronic antibiotic advice and approval systems have been shown to improve antimicrobial use[6,7] and these concepts have been included in the specifications developed for the E-medication management systems in hospitals.[8]

Furthermore, there is an increasing realisation that E-medication management systems in both hospital and general practice should incorporate strategies proven to improve antibiotic (and other drug) use and these desiderata do not necessarily occur by leaving the process to market forces. Australian E-Health governance arrangements are currently under review and new structures being proposed that have the potential to redress the above problems.[9]

Australia has a long history of initiatives to improve antibiotic use. These commenced in the late 1970s when there was concern in Melbourne teaching hospitals that an increasing incidence of antibiotic-resistant microrganisms reflected inappropriate antibiotic prescribing. A working party was set up to produce concise guidelines on appropriate antimicrobial therapy. The aim was to improve antibiotic prescribing in Victorian public hospitals. The first edition of *Antibiotic Guidelines* was a slim booklet of 30 pages designed to fit into a hospital doctor's white coat pocket. A modest grant from the then Hospitals and Charities Commission made the publication available free of charge to Victorian resident medical officers. By the 12th edition, *Therapeutic Guidelines: Antibiotic* had grown to over 300 pages; it addressed clinical problems in both hospital and general practice, had national authorship and is available in both print and electronic formats. Government subsidy ceased long ago; *Therapeutic Guidelines: Antibiotic* is now produced, marketed and sold by Therapeutic Guidelines Limited, an independent not-for-profit enterprise that distils best practice prescribing guidelines for Australian health professionals. A set of national guidelines now cover all major therapeutic areas.[10]

Initial audits of antibiotic prescribing showed that the mere distribution of guidelines had little impact on prescribing habits. However, when specific education campaigns targeted the discrepancy between what was practiced and what the guidelines recommended, antibiotic prescribing improved.[11] These concepts were ultimately incorporated into the Quality Use of Medicines pillar of Australian Medicinal Drug Policy[12] and operationalised nationally by the Pharmaceutical Health and Rational Use of Medicines (PHARM) committee and the National Prescribing Service (NPS).[13] National indicators show that antibiotic use in Australia has steadily improving since the mid 1990s.[14]

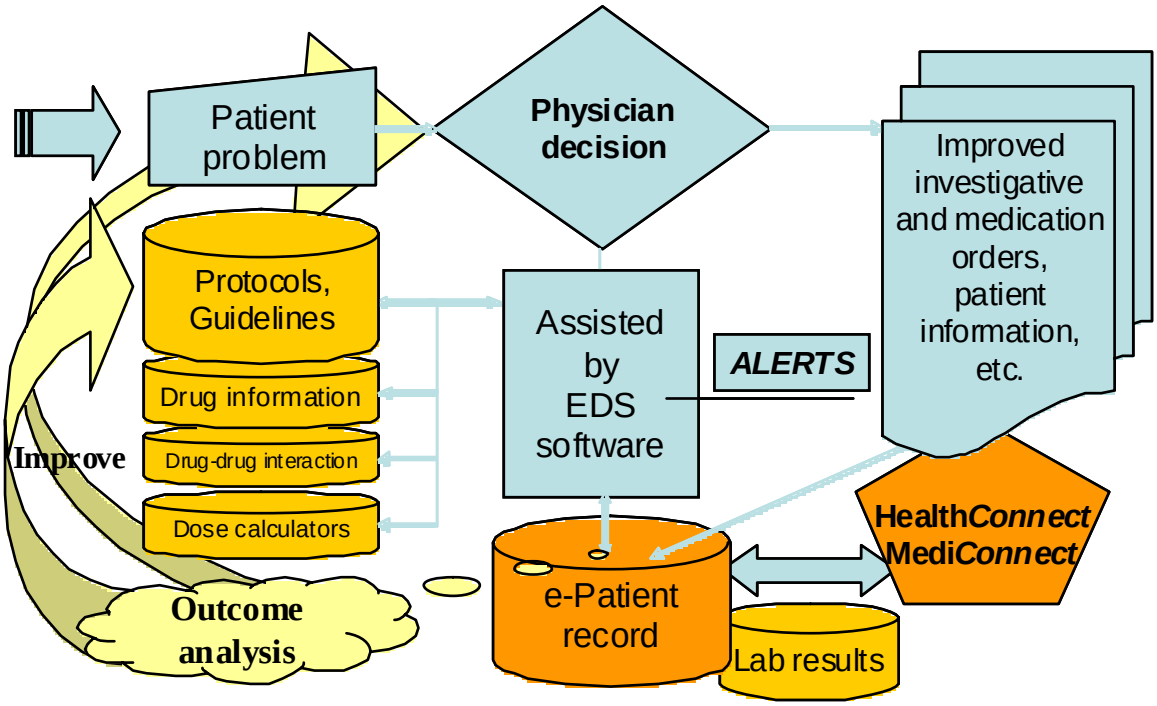
The iterative quality assurance system that evolved is as follows. First, regularly distil the scientific literature (and conduct research) in order to define and promulgate locally applicable, evidence-based therapeutic guidelines concerning affordable best-practice.

Second, assist health workers to compare their own prescribing / dispensing practice with what is recommended (drug utilisation and other health services research). Finally, where discrepancies exist, provide opportunities for practitioner reflection, targeted education and incentives to reduce the gap. The discrepancies found often highlight the need for health system reform to remove &/or reduce perverse incentives and reward good practice. In addition, the discrepancies found should be used to improve best-practice guidelines and educational efforts by an iterative process.

These principles need to be incorporated into undergraduate, postgraduate and continuing education of health professionals.[15] In addition, given that consumer "demand" plays some part in determining practitioner behaviour, public education campaigns that address particular problem areas are also required.[16] Furthermore, given the increasing use of clinical computer systems in both hospital and general practice (and the use of the Internet by consumers) information management and information and communication technology (IM/ICT) has a crucial role to play in system improvement. All of the above requires financial, human resources and capacity building.

Current IM/ICT activities are aimed at incorporating these principles into electronic decision support (EDS) software that interacts with the emerging electronic health record (the Australian Medi*Connect*, Health*Connect* and EDS projects).[17] The aim is to provide unobtrusive, succinct advice, tailored to a particular patient, at the time of prescribing. In addition, by comparing what is prescribed with what is recommended, such systems can provide individual feed-back to prescribers (and guideline authors) and monitor clinical performance indicators which in turn can be linked to best-practice incentive payments (Figure 1). HL7 (Australia) is working with other key players on the standards required for such systems.[18] Complementary activities are taking place internationally with HL7 concerning electronic health records and EDS.[19]

Figure 1 Electronic decision support concepts



References

[1] Nolan AM, Norquay CA, Dartnell JGA, Harvey KJ. Electronic prescribing and computer-assisted decision support systems. MJA 1999; 171: 541-543.

[2] General Practice Computing Group, Practice Incentives Program (PIP) statistics. Available at: http://www.gpcg.org/topics/pip.html

[3] Ahearn MD, Kerr SJ. General practitioners' perceptions of the pharmaceutical decision-support tools in their prescribing software. MJA 2003; 179 (1): 34-37. Available at: http://www.mja.com.au/public/issues/179_01_070703/ahe10824_fm.html

[4] Newby DA, Fryer JL, Henry DA. Effect of computerised prescribing on use of antibiotics. MJA 2003; 178 (5): 210-21. Available at: http://www.mja.com.au/public/issues/178_05_030303/new10320_fm.html

[5] Health Communication Network, General Practice Research Network. Available at: http://hcn.australiandoctor.com.au/gprn.asp

[6] Richards MJ,Robertson MB, Dartnell JGA, et al. Impact of a web-based antimicrobial approval system on broad-spectrum cephalosporin use at a teaching hospital. MJA 2003; 178 (8): 386-390. Available at: http://www.mja.com.au/public/issues/178_08_210403/ric10555_fm.html

[7] Grayson LM, Melvani S, Kirsa SW, et al. Impact of an electronic antibiotic advice and approval system on antibiotic prescribing in an Australian teaching hospital. MJA 2004; 180 (9): 455-458. Available at: http://www.mja.com.au/public/issues/180_09_030504/gra10569_fm.html

[8] Electronic Medication Management - a report for VDUAC by the Victorian Hospitals Electronic Prescribing and Decision Support (VHEPADS). Available at: http://www.vduac.org.au/emedman.pdf

[9] Boston Consulting Group. National Health Information Management and Information and Communications Technology Strategy. Available at: http://www.health.gov.au/healthonline/

[10] Therapeutic Guidelines. Available at: http://www.tg.com.au/home/index.html

[11] Hemming M. Therapeutic Guidelines: an Australian experience. International Journal of Pharmaceutical Medicine. 2000;14:259–264.

[12] Australian Quality Use of Medicines Policy. Available at: http://www.nmp.health.gov.au/quality.htm

[13] National Prescribing Service. Available at: http://www.nps.org.au/

[14] Roughead EE, Gilbert AL, Primrose JG, Harvey KJ, Sansom LN, Report of the national indicators: Evaluating the quality use of medicines component of Australia's National Medicines Policy. Publications Production Unit, Commonwealth Department of Health and Aged Care, Canberra, 1999.

[15] National Prescribing Curriculum. Available at: http://nps.unisa.edu.au/new/index.htm

[16] National Prescribing Service. Common colds need common sense campaign. Available at: http://www.gottacold.com/index.html

[17] Health Online Projects. Available at: http://www.health.gov.au/healthonline/projects/projects.html

[18] HL7 (Australia) Electronic Clinical Decision Support Page. Available at: http://www.hl7.org.au/CDSS.htm

[19] HL7 Electronic Health Record Functional Model and Standard Home Page. Available at: http://www.hl7.org/ehr/index.asp