Technology and patient safety: only part of the solution

Potentially catastrophic errors can be introduced at any stage of the medication pathway from selecting a drug for a patient to it being administered. Persistently high rates of medication error are of concern internationally. Recently, several novel approaches to improving medication safety have been reported. Do they offer the prospect of improved patient safety?

Medication errors: a UK perspective

The factors leading to medication errors are many, complex and, arguably, underappreciated. Prescribing errors can be subdivided into 'slips' caused by lapses in concentration, such as changes inadvertently introduced when re-writing drug charts, and 'mistakes' where an inappropriate drug or dose is chosen because of a lack of training or knowledge or lack of availability of information such as up-to-date guidelines or laboratory results (Dean et al, 2002). Administration errors are also relatively common – the most serious being that a medication is administered to the wrong patient (Ridge et al, 1995).

The EQUIP study (Errors-Questioning Undergraduate Impact on Prescribing) commissioned by the General Medical Council of the UK (but as yet unpublished in a peer-reviewed journal) reported that, over a 7-day period, 8.9% of all prescriptions in a group of nineteen hospitals contained errors (EQUIP, 2009). This surprisingly high rate of medication error is similar to those reported in other studies conducted in the UK and the USA, documented in a literature review carried out as part of the EQUIP study. This is, therefore, not a uniquely British problem. However, there are exacerbating factors particular to the UK.

The stresses imposed by changes in working patterns following adoption of the European Working Time Directive, and hospital performance targets such as the maximum 4-hour emergency department wait, means that patients are more likely to be seen under time pressure by junior doctors who are unfamiliar with the patient. Almost 40% of UK medical schools do not teach therapeutics at all. Of the others, the majority do not teach therapeutics per se, but have a 'vertical strand' running through the clinical course (O'Shaughnessy et al, 2010). The worryingly poor aptitude for and attitude towards prescribing displayed by the newly qualified doctors who were the subject of the EQUIP study implies that this arrangement is unsatisfactory.

An earlier analysis of prescribing errors in another UK teaching hospital made the point that 'error-producing conditions' such as poor training, time pressure or fatigue will increase the likelihood of an error, unless mechanisms are in place to detect and prevent this (Dean et al, 2002). This suggests that any successful strategy to reduce medication error must include alterations to working patterns and training as well as introducing new technologies. What contribution can new technology make towards improving patient safety in this context?

Low and high technology solutions

Many solutions, using both basic and advanced technology, are now being investigated to prevent medication errors by altering work practices, preventing slips and assisting decision making.

The relatively simple strategy of using a checklist to standardize perioperative management significantly reduces errors, complications and death rates (Haynes et al, 2009). Work is now underway to ascertain whether checklists can be applied to wider areas of medicine.

Bar-code identification of patients on wristbands was recently reported to reduce rates of medication administration error, with consequent reductions in complications and inpatient stay (Poon et al, 2010). This is an attractive technology, as the financial cost is relatively low, and training of personnel relatively simple.

More complex (and expensive) electronic prescribing systems are gradually being introduced into NHS hospitals. These systems have the advantage that they eliminate the entire class of errors caused by illegibility or incorrect transcription of drug charts. Additionally, most systems are able to interface with laboratory results, and can also provide access to drug information such as interactions.

Local clinical guidelines for medical staff have become an increasingly important quality assurance tool, as changes to working patterns mean that prescribing decisions are being made by junior members of the medical team for patients with whom they are often unfamiliar. Many hospitals now produce electronic versions of guidelines, but these may be poorly accessible at the point of prescribing, and updated in a haphazard fashion. This is an important and neglected area of hospital medicine, especially given that the enabling technology for producing guidelines that are accessible via hand-held devices is readily available (Bates and Gawande, 2003).

Introducing new systems into hospital is non-trivial. A study of the effects of implementing electronic prescribing systems in the UK found that the number of prescribing errors is reduced, but that there a qualitative change in the error burden, i.e. fewer errors overall, but some types of error introduced by the new system (Donyai et al, 2008). The lesson is that implementation of electronic prescribing (or any technological tool) has the potential to introduce error, unless practice is altered appropriately.

Training: another part of the solution

Even if an expensive electronic prescribing package is in place, when a prescriber doesn't understand therapeutics, an error will still occur. The EQUIP study noted, along with the high prescribing error rate, a lack of a 'safety culture' and obvious

training and educational deficiencies in newly qualified UK doctors (EQUIP, 2009). It seems remarkable that so little emphasis in medical training is placed on safe prescribing in the UK, compared with, for example, the professional development spine that runs through all UK medical school curricula. While attempts to address this national deficit are being made (Weetman et al, 2010), there is a clear need for a more active role from the bodies concerned with the undergraduate and postgraduate training of doctors.

Conclusions: decision support in medicine

Many organizations, such as the military, air traffic control or financial trading companies, may be damaged by decisions made under time pressure by their most junior members. Invariably, decision support mechanisms have been implemented in these organizations to prevent (or at least ameliorate) the adverse consequences of poor decision making. In general these comprise specific training of staff, easy access to continuously updated data and mechanisms to prevent slips or accidental mistakes. Arguably, medicine has not yet embraced this type of thinking.

The emergence of enabling technologies such as bar-code patient identification and electronic prescribing along with increasing awareness of the problem of medication errors presents an opportunity to improve significantly patient safety in the UK. This will certainly require adoption of new technologies, but changing the undergraduate and postgraduate training of prescribers and raising the profile of medication safety in the NHS is equally important. BJHM

Ross A Breckenridge
Senior Lecturer and Consultant Physician
Division of Medicine
University College London
London WC1E 6JJ

Bates DW, Gawande AA (2003) Improving safety with information technology. *N Engl J Med* **348:** 2526–34

Dean B, Schachter M, Vincent C, Barber N (2002) Causes of prescribing errors in hospital inpatients: a prospective study. *Lancet* **359:** 1373–8

Donyai P, O'Grady K, Jacklin A, Barber N, Franklin BD (2008) The effects of electronic prescribing on the quality of prescribing. *Br J Clin Pharmacol* **65:** 230–7

EQUIP (2009) An in depth investigation into the causes of prescribing errors by foundation trainees in relation to their medical education-EQUIP study. www.gmc-uk.org/about/research/research_commissioned_4.asp (accessed 1 September 2010)

Haynes AB, Weiser TG, Berry WR et al (2009) A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med* **360:** 491–9

O'Shaughnessy L, Haq I, Maxwell S, Llewelyn M (2010) Teaching of clinical pharmacology and therapeutics in UK medical schools: current status in 2009. *Br J Clin Pharmacol* **70:** 143–8

Poon EG, Keohane CA, Yoon CS et al (2010) Effect of bar-code technology on the safety of medication administration. *N Engl J Med* **362:** 1698–707

Ridge KW, Jenkins DB, Noyce PR, Barber N (1995) Medication during hospital drug rounds. *Qual Health Care* **4:** 240–3

Weetman T, Aronson J, Maxwell S (2010) Reducing prescription errors. *Lancet* **375:** 461–2

KEY POINTS

- There is a high incidence of prescribing error in UK hospitals.
- In general, UK medical students are not adequately trained in therapeutics.
- Several technologies have now been developed with the potential to make prescribing and administration of medicine safer.
- Along with introduction of new technologies, a greater awareness of the factors leading to prescribing error and alterations in UK medical practice are needed to reduce medication error.