EDITORIAL II

Medication errors: can we prevent them?

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In this issue of the BJA, you will find many reviews which are related to pharmacology of the drugs used in anaesthesia and intensive care, and the recent advances. This editorial asks for a little pause for considering the safety of medication use in clinical practice, and how can it be improved.

Medication errors, including those occurring in anaesthesia and intensive care, continue to be among the top 10 causes of overall mortality worldwide. 1,2 Most anaesthetists would admit to having made at least one drug error in their working practice. 3 The estimated rate of drug errors is reported to be around one error in every 133 anaesthetics. 2 In intensive care practice, the incidence of adverse drug events is reported to be \( \sim 130 \) errors per 1000 patient days. 4 It is worth noting that these figures are likely to be an underestimate of the true picture; this is because of a well-recognized culture of under-reporting in almost all health-care systems. 5

With regard to the timing of the critical incidents, adverse drug events are known to occur more frequently during the maintenance phase of anaesthesia (42%), compared with either during induction (28%) or at the beginning of the surgery (17%). 5 In the intensive care, the administration of a single dose of medication may require between 80 and 200 individual steps. These steps are related to prescription, transcription, preparation, dispensing, and/or administration of the drug. Errors related to the administration of drugs are more frequent (53%), when compared with those related to either prescription (17%), preparation (14%), or transcription (11%). 6 Among the drugs used during anaesthesia, i.v. induction agents, neuromuscular blocking agents, opioids, sedatives, anticholinergic drugs, and local anaesthetics have all been reported to be involved in either wrong dose, wrong route, or wrong order errors. In the intensive care, the commonly involved drugs in the reported errors include heparin, insulin, inotropes, sedatives, potassium chloride, magnesium sulphate, and antibiotics.

The consequences of medication errors range from no harm to death. While many patients will escape harm, some will sustain significant injury, resulting in long-term harm and/or death, with increased costs to health-care systems. 2 These errors damage public confidence in health-care professionals and organizations. In addition, as a second victim, the health-care professional suffers from a damaged reputation, lack of confidence, and/or charges of negligence or even of manslaughter.

The patient safety movement depends upon effective strategies for preventing errors in health-care services. In order to develop these strategies, it is important to understand the causes and the conditions which lead to their occurrence. In up to 87% of the instances of medication errors, human factors and organizational inadequacies have been implicated. 8–10 Everyday experience would suggest that staff shortages, cognitive overload of members of staff, distractions, poor communication, haste, and fatigue are common contributory factors. 11 In intensive care, other predisposing conditions may exist. These include severity of patient illness, programming of infusion pumps, inexperience of the staff, frequent prescription changes, and a high level of prevailing stress. 11 12 Therefore, any strategy for preventing errors must take into account the whole range of factors from those related to patients to those related to organizational systems. The strategies which are focused entirely on the front-end health-care professional can be only partially successful.

Increased awareness and education of staff about organizational and human factors is crucial in the prevention of medication errors. 13 Anaesthetic practice is unique because anaesthetists are personally responsible for all the steps from drug preparation to drug administration. Therefore, they need to have heightened awareness of the risk factors which create conditions for drug errors to occur. In addition, anaesthetists would need to engage actively with their organizations for improving systems which prevent or minimize drug errors. In general, the guiding working principles for reducing drug errors are: 14 15

(i) reduce the complexity within a system
(ii) bring in redundancy and standardization, and
(iii) double-check ampoules, syringes, doses, and equipment before use.

Specific recommendations to minimize drug errors, as drawn from published literature, 2 16 are given in the following:
(i) Information: ensure consistency in documentation, and allow free uninterrupted flow of information from pre-assessment to the postoperative period. Also add prompts regarding drug allergies, to prevent omissions, possible overdose, and possible interactions. In intensive care, this may also require enhanced pharmacist support.

(ii) Communication: avoid using abbreviations, incorporate smart electronic prescribing, and clear documentation.

(iii) Standardized packaging and presentation: smart ampoule designs and labelling, segregate look alike packaging or ampoules, standardize storage of the drugs using cart trays, consider pre-filled syringes, ensure ampoules with concentrated solutions are not mixed with others, ensure drugs for intrathecal/epidural use are stored separately and are clearly marked, and segregate known hazardous products.

(iv) Standardize administration: standardize procedures for drawing up of drugs, avoid distractions, use clear standardized labelling, use bar-coding, and use electronic double check or two-person double check.

(v) Environment and flow: minimize advance preparation of drug syringes, remove unused medications, minimize distractions during drug preparation and administration, and raise staff awareness and the level of education.

(vi) Quality assurance and risk management: report all drug errors and near misses irrespective of whether or not the patient came to harm, have systems in place to analyse these incidents and learn from them, convert lessons learnt into improvements in the systems with clearly defined goals, and monitor progress.

In addition to these specific measures, other recommended measures for use in the intensive care include avoiding extended working hours, computerized i.v. infusion pumps, standardized protocols and infusion regimes, medication reconciliation, and support systems for clinical decisions.17

Despite many recommendations which have been made to minimize drug errors, their uptake in clinical practice, in my opinion, is extremely low. With the exception of syringe labelling, other measures of preventing drug errors either do not exist or there is large variation in their implementation within, and between, organizations. Under-reporting still remains endemic among health-care professionals, and this limits the capacity of health-care workers and organizations to learn from the errors. Also, because of under-reporting, the true scale and extent of the problem, and its impact on patient safety, remain underestimated. A recent study indicated that there may be cultural barriers to adopting known measures of preventing drug errors.15 Many clinicians would still deny the fact that drug errors represent a significant problem. It is also true that, as a profession, we have only just begun to understand the causation of incidents, and the role of system improvements in their prevention. For the success of an effective long-term strategy, acceptance of the problem by clinicians is the first step, and reporting it the next. This should be followed by mature discussion and analysis of the incidents. The professional leadership and organizational management would then aim to convert lessons learnt from incidents into systems improvement.18

We must understand the nature of barriers and enablers to the improvements in patient safety at all levels. At present, there is paucity of studies exploring the barriers and enablers for the adoption of measures that are known to prevent drug errors in anaesthesia and intensive care. These studies are essential to gain insight into the cultural issues which will be required to be addressed for the success of any strategy. One of the barriers, which is consistently raised, is the argument that there remains a lack of class 1 evidence in favour of any of the recommended measures to reduce medication errors. Waiting for the evidence to emerge before implementing a change would inevitably run the risk of continuing significant patient harm. Therefore, we need a paradigm shift in the way we address the need for evidence before adopting the measures which improve patient safety. The approach has to rely more on commonsense. Patient safety is arguably one area of medicine where a considered implementation of interventions may have to go alongside the generation of the evidence of their success. However, implementation of safety measures should not be without a thorough engagement with the science and the tools of hazard assessment of the proposed interventions. All efforts should be made to prevent any unintended harm resulting from the introduction of a new intervention itself.

On the basis of current knowledge and evidence, it is now time to generate professional opinion about which of the recommendations, in isolation or grouped in a bundle, offer pragmatic and feasible solutions for preventing drug errors in anaesthesia and intensive care. Professional and organizational leadership will be required for a step-wise implementation of these measures in health-care systems. Implementation of any changes should also be accompanied by systematic collection of data to show whether or not these have resulted in improvements in patient safety.

Our profession owes it to the patient that we do our very best to avoid any preventable harm. The health-care industry, when compared with other high-risk organizations (aviation, oil, nuclear), has been slow in adopting the culture, concepts, and measures of patient safety. At present, there is exponential growth in the literature regarding how medication errors can be prevented, and patient safety improved. Society will be justified in making harsh judgements if we allow continuing inertia to delay the implementation of measures to prevent drug errors and improve patient safety.

**Conflict of interest**

R.P.M. is Chairman of Safe Anaesthesia Liaison Group based at the Royal College of Anaesthetists.
Development of the faculty of intensive care medicine

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On November 22, 2010, it was my great pleasure, in the presence of many of the Presidents from other contributing Colleges, to admit Professor Julian Bion as the first Dean of the new Faculty of Intensive Care Medicine (ICM) at its inaugural meeting. The journey to reach this moment bears reflecting upon as an example of how events develop over time based on the preceding efforts of others; as well recognized by Newton.1

The Intensive Care Society (ICS) was formed in 1971; the first such organization in the world. The Society continues to represent the interests of all those working in the specialty and remains committed to developing multidisciplinary input into training in ICM.

Although there are early references to discussions on developing a Faculty, it was not until the advent of the Joint Advisory Committee on Intensive Therapy (JACIT) that formal training posts were even established. In December 1992, the parent Royal Colleges of Anaesthetists, Physicians (England) and Surgeons (England) had agreed to develop a means of training doctors whose specialist skill was to be in ICM. The intercollegiate committee so formed eventually became the Intercollegiate Board for Training in Intensive Care Medicine (IBTICM) in September 1996 with a remit to take on the responsibility of regulating training in ICM. The first sitting of the Board's Diploma in ICM was held in the summer of 1998.

After authorization by Frank Dobson, then Secretary of State for Health, changes were made to Part II of Schedule 2 of the European Specialist Medical Qualifications Order (the 'Order') on June 7, 1999, to include ICM as a specialty. This enabled the Specialist Training Authority (STA) to recognize ICM as a specialty that could develop a Certificate of Completion of Specialist Training (CCST) leading to entry to the Specialist Register of the General Medical

References