Crisis management during anaesthesia: problems associated with drug administration during anaesthesia

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Background: Modern anaesthetic practice relies upon the administration of a wide range of potent drugs given by a variety of routes, at times in haste or under conditions of stress. Problems associated with drug administration make up the largest group of incidents reported during anaesthesia, with outcomes including major morbidity and death. It was decided to examine the role of a structured approach to the diagnosis and management of drug problems during anaesthesia.

Objectives: To examine the role of a previously described core algorithm “COVER ABCD–A SWIFT CHECK”, supplemented by a specific sub-algorithm for drug problems, in the detection and management of drug problems occurring in association with anaesthesia.

Methods: The potential performance of this structured approach for the relevant incidents among the first 4000 incidents reported to the Australian Incident Monitoring Study (AIMS) was compared with the actual performances as reported by the anaesthetists involved.

Results: Among the first 4000 reports received by AIMS there were 1199 reports which detailed 1361 incidents involving the use of drugs. Contributing factors named included errors of judgement (20%), lack of attention (17%), and drugs deemed to have been given in haste. Major morbidity or prolonged stay ensued in over one quarter of reports and 15 patients (1.25%) died. Drug overdose, side effects, and allergic reactions accounted for the majority of serious outcomes.

Conclusion: It was judged that the use of the COVER–ABCD algorithm during the course of an anaesthetic, properly applied, would prevent many drug related incidents from occurring. The sub-algorithm presented here provides a systematic framework for detecting the causes of drug related incidents.

M odern anaesthetic practice relies upon the administration of a wide range of (usually) potent drugs given by a variety of routes, at times in haste or under conditions of stress. The incidence of medication errors rises markedly with polypharmacy.1 Pharmacological incidents were the most commonly reported problem in the first 4000 incidents reported to the Australian Incident Monitoring Study (AIMS), constituting 30% of all reports.2

A previously published paper by the AIMS group confined itself to the “wrong” drug problem, concluding that syringe swaps of labelled drugs was the most common incident,1 usually resulting from a “slip”—this being the result of “absent mindedness”.2 A number of preventative strategies were proposed, including checking and rechecking of all ampoules, drawing up and labelling of one drug at a time, and supplying colour coded ampoules and syringes—for example, the use of a syringe with a red plunger for relaxants.3

In 1993 a “core” crisis management algorithm represented by the mnemonic COVER ABCD–A SWIFT CHECK (the AB precedes COVER for the non-intubated patient) was proposed as the basis for a systematic approach to crisis management during anaesthesia where it is not immediately obvious what should be done or when actions taken have failed to remedy the situation.7 This was validated against the first 2000 incidents reported to AIMS. AIMS is an ongoing study which involves the voluntary anonymous reporting of any unintended incident which reduced or could have reduced the safety margin for a patient.2

It was concluded that, if this algorithm had been correctly applied, a functional diagnosis would have been reached within 40–60 seconds in 99% of applicable incidents and the learned sequence of actions represented by the COVER portion would have led to appropriate steps being taken to handle the 60% of problems relevant to this portion of the algorithm.5 However, this study also showed that the 40% of problems represented by the remainder of the algorithm ABCD–A SWIFT CHECK were not always promptly diagnosed or appropriately managed.2 7 It was decided that it would be useful, for these remaining problems, to develop a set of sub-algorithms in an easy-to-use crisis management manual.8

This study reports on the potential place of the COVER ABCD–A SWIFT CHECK algorithm in the diagnosis and initial management of pharmacological errors, provides an outline of a specific crisis management sub-algorithm for drug associated incidents during anaesthesia, and examines the potential value of using this structured approach.

METHODS

Of the first 4000 incidents reported to AIMS, those which made reference to drug incidents were extracted and analysed for relevance, presenting features, causes, diagnosis and outcome. Those due to vascular access problems and those resulting in (or with the potential for) awareness are included but are dealt with in greater depth elsewhere in this set of articles.9 10 For completeness, problems arising from the administration of blood and its products are also included in the analysis.

The COVER ABCD–A SWIFT CHECK algorithm, described elsewhere in this series of articles,6 was applied to each relevant report to determine the stages at which the problem might have been diagnosed and to confirm that activating the COVER portion would have led to appropriate initial steps being taken. As drug problems are not completely dealt with by this algorithm, a specific sub-algorithm was developed (see fig 1) and its putative effectiveness was tested against the reports. How this was done is described elsewhere in this series of articles.6 The potential value of this structured approach—that is, the application of COVER ABCD–A SWIFT CHECK to the diagnosis and initial management of these
problems, followed by the application of the sub-algorithm for drug problems—was assessed in the light of the AIMS reports by comparing its potential effectiveness for each incident with that of the actual management as recorded in each report.

**RESULTS**

Among the first 4000 AIMS reports there were 1199 reports involving drug incidents (30%). A total of 1361 drug related incidents were reported as some incidents involved more than one drug problem. Table 1 summarises the major categories of incidents. The most common problems were overdosage (20%) and giving the wrong drug (17%).

Many factors were judged to have contributed to the incidents—most commonly, errors of judgement, \((n = 240, 20\%)\); inattention \((n = 211, 18\%)\); drugs given in haste \((n = 200, 17\%)\); and problems with communication \((n = 163, 14\%)\). Further details are given in table 2.

Outcomes from these incidents varied from no change through to death. More than one outcome occurred in a number of reports. For instance, patients suffering major morbidity often progressed to a prolonged hospital stay or unplanned high dependency admission. Table 3 provides a summary of the outcomes.

Fifteen deaths were reported in this series (table 4). The most commonly reported problem in this group was related
Incidents resulting in major morbidity in this series (table 5). Not surprisingly, management of this group of problems often resulted in ongoing high dependency care and/or an abnormally prolonged hospital stay.

**DISCUSSION**

Problems related to the administration of drugs made up 1199 (30%) of the first 4000 reports received by AIMS. Outcomes ranged from no change (47%) through to death in 15 reports (1.25%). Thus, drug related problems in this series are common and many had serious consequences. The majority may be regarded as potentially preventable, however difficult in clinical practice this may be to achieve.

Adverse drug events are common throughout medical practice and may result in serious consequences. Problems frequently arise as a result of complex chains of events, so robust systems must be in place to minimise or eliminate such errors. A recent project reported significant reductions in adverse drug events (27%) and a concurrent rise in error detection and prevention (12%) resulting from changes in the systems in place by which drugs were administered.13 These improvements were sustained. An integrated drug administration system specifically for use in anaesthesia has been developed, also aimed at preventing drug administration errors by reducing the number of steps, automating aspects of the process, and rendering them more transparent.14 15

In the course of anaesthetic practice, where drugs are often given during periods of haste and stress, the potential for error remains great. Problems may result from several broad groups of errors, starting with drawing up and labelling of drugs in syringes, through to administration via any apparatus and any route; the pharmacological effects and side effects of the drug may also cause problems. Because drug administration during anaesthesia is commonly by the intravenous route, this paper should be regarded as a companion to the paper dealing with problems with vascular access which is presented elsewhere in this series.9

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Finally, it is important that a full explanation of what happened be given to the patient, that the event and the results of any tests should be documented in the anaesthetic record and, if appropriate, that the patient be given a letter to warn future anaesthetists. A permanent warning bracelet may be required for the patient. If a particular precipitating event was significant or a particular action was useful in resolving the crisis, this should be clearly explained and documented.

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REFERENCES