

Anaesthesia Incident Monitoring Study in Hospital Kuala Lumpur - The Second Report

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Summary

Critical incident reporting is a useful quality improvement technique for reducing morbidity and mortality in anaesthesia. This study analyses 93 cases in Kuala Lumpur Hospital from July 1995 to January 1997. The main incidents during anaesthesia in this study were airway incidents. While human error was identified as the main factor contributing to the occurrence of adverse incidents. Critical incident monitoring plays an important role in identifying potential problems, which may lead to disaster. The findings from this report of the anaesthesia incident monitoring study continued to indicate the occurrence of similar problems seen in an earlier report⁹. The identification of common incidents can be used to identify risk factors and minimise repetition of such incidents.

Key Words: Critical incident, Anaesthesia, Morbidity, Quality assurance

Introduction

The "critical incident technique" was described by Flanagan in 1954¹, when it was used to reduce loss of military pilots and aircraft during training. Jeffrey Cooper in 1978 introduced it into anaesthesia as a method to study errors during administration of anaesthesia². He defined a critical incident as an occurrence that could have led (if not discovered or corrected in time) or did lead to an undesirable outcome, ranging from increased length of hospital stay to death or permanent disability. The critical incident technique was first used to study anaesthesia-related problems in Townsville, Australia in the early 1980s^{3,4}. Subsequently, incident reporting systems were introduced at the Prince of Wales Hospital in Sydney⁵ and at the Royal Women's Hospital in Melbourne⁶. The Australian Patient Safety Foundation (APSF) was set up to co-ordinate the Australian Incident Monitoring Study (AIMS) which involved participation of a wide range of hospitals throughout the country^{7,8}.

Critical incidents during anaesthesia are currently

widely monitored as a form of quality assurance in many anaesthetic departments. An anaesthetic incident monitoring study in Hospital Kuala Lumpur was started in May 1994 as part of the quality assurance programme in both the departments of anaesthesia under Ministry of Health and the Universiti Kebangsaan Malaysia. The initial findings from analysis of 185 cases from May 1994 to June 1995 were published in a local journal⁹. This study analysed the results of cases reported during the period from July 1995 to January 1997 and compared them with the previous report.

Materials and Methods

The study is modelled on the AIMS study developed in Australia. Participating doctors are invited to report, on an anonymous and voluntary basis, any unintended incident, which reduced, or could have reduced, the safety margin for a patient. Any incident could be reported, not only those which were deemed "preventable" or were thought to involve human error.

A prescribed form is available to facilitate collection of data. These forms were placed at convenient sites throughout the operating theatre complex. This form contains general instructions to the reporter, key words and space for a narrative of the incident, structured sections for what happened (with subsections for circuitry incidents, circuitry involved, equipment involved, pharmacological incidents and airway incidents), why it happened (with subsections for factors contributing to the incident, factors minimising the incident and suggested corrective strategies), the type of anaesthesia and procedure, monitors in use, when and where the incident happened, the patients' age and a classification of patient's outcome. Strict confidentiality is preserved to avoid the fear of penalty being imposed on the reporting party. Completed forms were deposited into boxes placed in specific sites and were collected at intervals for analysis.

Results

Patients' Characteristics and Case Distribution

For the period from July 1995 to January 1997, a total of 93 reports were received. Reports were mainly voluntary, but in some instances the reports made by junior doctors were on request by senior supervisors in charge of the theatre.

The spread of cases amongst the various disciplines was as follows: general surgery 31, Ophthalmology 18, Neurosurgery 8, ENT 7, Plastic Surgery 7, Orthopaedic 6, Urology 3, Gynaecology 2, Obstetrics 2, Dentistry 1 and four patients from other departments. When classified according to the American Society of Anaesthesiologists Classification¹⁰, patients fell into the following groups: ASA I:- 38 cases, ASA II:- 45 cases, ASA III:- 8 cases, and ASA IV:- 2 cases. Majority of reported incidents occurred among ASA II patients. From the point of view of age, incidents occurred with the following frequency: patients aged greater than 14:-68 cases, patients aged 1-14 years:-10 cases, patients aged less than one year :-3 cases and in neonates :-2 cases. Majority of problems were reported in adults.

Anaesthesia Technique and Monitoring

Most of the reports involved elective cases. This is

unexpected, and may suggest under-reporting of incidents occurring during emergency cases. Ninety incidents (96.7%) reported occurred during general anaesthesia, reflecting the dominance of general anaesthesia as the preferred technique. Five incidents occurred in cases under regional anaesthesia or nerve block. Where local infiltration was used only one case was reported in which a critical incident occurred. Eighty-eight critical incidents (94.6%) were reported in the operation theatre, 3 were reported in the recovery area and only one in the intensive care ward. Forty critical incidents (43%) occurred during the maintenance phase of anaesthesia while the incidents reported during recovery from anaesthesia formed a minority. Problems before induction of anaesthesia did not feature prominently in this second report. Eighty-three (89.2%) cases reported involved controlled ventilation (IPPV). No critical incident involving spontaneously breathing patients was reported.

Incident Categories

Incidents related to the airway (e.g. obstruction of the airway from various causes) formed the bulk of the reported incidents. A lot of these cases were thought to involve bronchospasm from different causes (Figure 1). Difficult intubation constituted 12.9% while oesophageal intubation constituted 1.1% of the incidents reported. Incidents involving the endotracheal tube featured more prominent compared to the first report where disconnection involving the tubing of the anaesthetic circuits formed the majority of reported cases as shown in Figure 2.

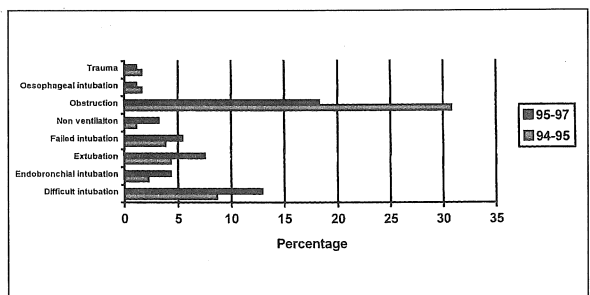


Fig. 1: Airway incidents - critical incidents during anaesthesia where the airway is involved

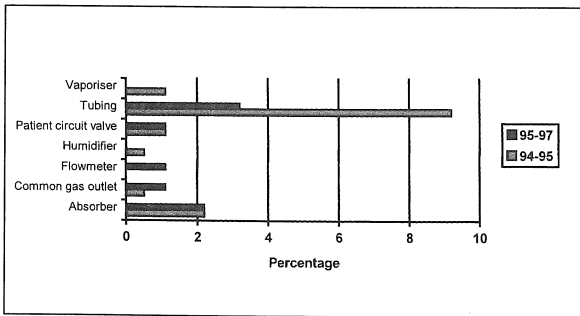


Fig. 2: Circuitry and equipment involved in cases under anaesthesia where critical incidents occurred

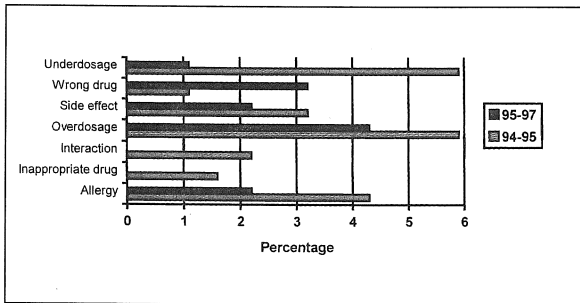


Fig. 3: Pharmacological incidents - critical incidents involving drugs

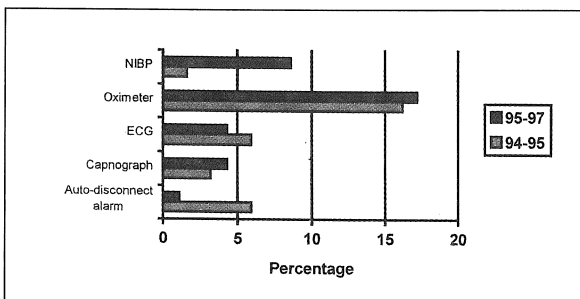


Fig. 4: Monitor detection of critical incidents

In the first report under-dosage of anaesthetic drugs was most common but became much less frequent in this second report. Over dosage still seems to be common (3.6%). The incidents of errors in drug administration

were very low in the first report but increased markedly in the second report (Figure 3). Anaphylaxis was important in the first report but became very infrequent in this report.

The pulse oximeter was still the most useful monitor in terms of ability to detect any untoward incidents occurring during anaesthesia (Figure 4). The oxygen analyser was again found to be not useful for detection of critical incidents in this second report. Blood pressure monitoring ranked second in monitor detection of critical incidents while in the first report it ranked very low.

Factors Contributing to Incident, Factors, Minimising, Corrective Strategies and Outcome

Error of judgement constituted the greatest factor contributing to the occurrence of critical incidents (Figures 5 & 6). Monitor detection still played a very

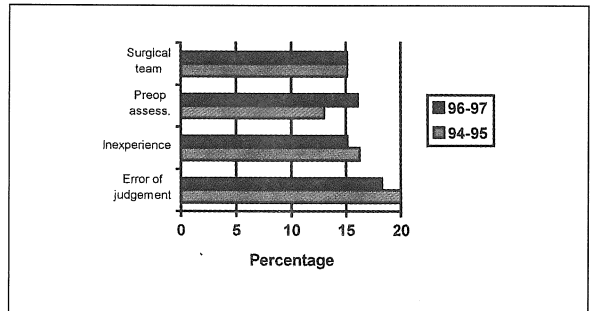


Fig. 5: Factors contributing to occurrence of critical incidents

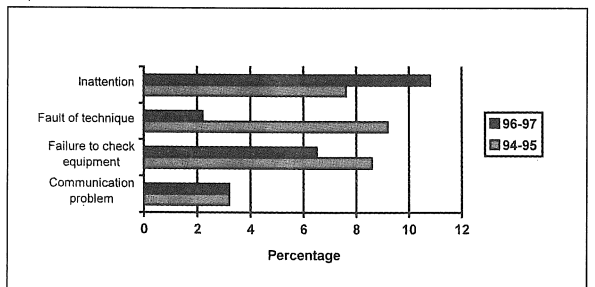


Fig. 6: Factors contributing to occurrence of critical incidents

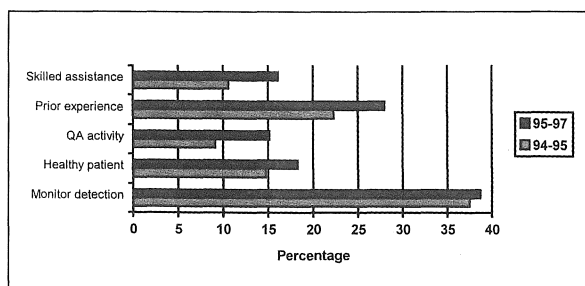


Fig. 7: Factors minimising occurrence of critical incidents

important role in identifying any untoward incident during anaesthesia. In this second report a high percentage of incidents (38.8%) were identified by a monitor (Figure 7). Many of the cases involved healthy patients thus serious consequences were not seen. Quality assurance activities were recognised as very essential to prevent future occurrence of similar incidents.

No untoward effects were seen in 77.4% of the patients involved. Minor morbidity accounted for 2.2%, while prolonged stay was recorded in 1.1% and 5.4% of patients reported major morbidity. Although associated with no adverse outcome in the majority of cases, critical incident monitoring provides a reasonable indication of what is likely to cause morbidity and death. Death in our report was 6.5%. There was one case of awareness in this report.

Discussion

Critical incident reporting has many advantages as a tool for improving safety during anaesthesia. A prescribed form provided for reporting encourages uniform collection of data and makes reporting easy and more systematic. Far better than mortality studies, this minimises outcomes bias, and as there is usually no adverse outcome, so there is medico-legal implications for the reporter. In this second report however, marked drop in reporting rate is a significant problem despite active 'encouragement' by supervisors, especially when junior doctors are involved. Reports of out of office hours critical incidents were even less in number.

The majority of incidents involved the airway, in particular airway obstruction similar to the first report⁹. Incidents involving the endotracheal tube featured more prominent compared to the first report where disconnection involving the tubing of the anaesthetic circuits formed the majority of the reported cases. This is consistent with results of morbidity and mortality studies reported in the literature world-wide^{2,34,35}. Most of the incidents reported involved general anaesthesia with controlled ventilation, reflecting the current dominance of this technique in our practice. In the Australian Incident Monitoring Study, for the category of airway problems, 9% of incidents involved the endotracheal tube; the commonest of which was endobronchial intubation¹⁵. Difficult intubation was reported more frequently in this second report but is still more compared to the Australian Incident Monitoring Study²³. The occurrence of oesophageal intubation was comparable in both our reports as well as with that reported in the Australian Incident Monitoring Study²⁸. Several critical incidents involved various equipments, the causes included unfamiliarity with the equipment or sometimes faulty equipment.

Amongst the first 2,000 incidents reported to the Australian Incident Monitoring Study, there were 144 incidents in which the "wrong drug" was nearly or actually administered to a patient. Thirty-three percent of the incidents involved ampoules and just over 40% syringes; in over half of the latter, the syringes were of the same size, and also, in over half, they were correctly labelled. In 81% of the 144 incidents the "wrong drug" was actually given. This was more common with syringes (93%) than ampoules (58%). Thus the most common error was actually giving the wrong drug from a correctly labelled syringe. The most common drug involved was a muscle relaxant in both ampoule and syringe incidents¹⁸. Our low incidents did not compare well with the problems reported from Australia, thus may suggest gross under reporting of pharmacological incidents in the first report⁹ although reporting had improved in the second report. Severe anaphylaxis was not reported in both our reports and in fact the incident had dropped in the second report, while two deaths related to anaphylaxis were reported in the Australian Incident Monitoring Study²⁶. It is also evident that critical incidents occurred as frequently during the induction as well as during the maintenance phase of

anaesthesia. In both our reports, the occurrence of critical incidents during the preoperative phase was low. A number of areas of concern specific to the preoperative period were identified in the Australian Incident Monitoring Study. Inadequate coordination between surgical and anaesthetic staff in patient preparation was a frequent cause of preoperative incidents. Improvement in this area may reduce surgical delays and patient morbidity²⁹.

The major contributing factor identified in both our reports was error of judgement, a human error. This displayed similarities between our findings and those of Cooper's original study².

The pattern of monitor usage depended on the clinical situation in each case, although minimal monitoring standards are defined in our routine anaesthetic practice. Monitor detection of adverse events during anaesthesia identified the pulse oximeter to be the most useful individual monitor in both our reports. In the Australian Incident Monitoring Study; in 52 % of the incidents a monitor detected the incident first. In this report the pulse oximeter (17.2%) together with the capnograph (4.3%) accounted for over half of the monitor detected incidents. The oximeter would have detected more (over 40% of the monitor detected incidents) had its more informative modulated pulse tone always been relied upon instead of the "beep" of the ECG^{14,17,19}. The oxygen analyser was not useful in detecting critical incidents in both our reports, but in the Australian Incident Monitoring Study the oxygen analyser detected 1% of the critical incidents, a figure which the authors thought would have been much higher had the oxygen analyser been used on more occasions³⁰. Blood pressure monitoring ranked very low in the ability to detect critical incidents in the first report⁹ but improved in this second report up to being ranked second, whereas in the Australian Incident Monitoring Study, blood pressure monitoring ranked fourth in monitor detection of critical incidents²¹. The stethoscope did not pick up any critical incident in this second report. In the Australian Incidents Monitoring Study it was considered that the stethoscope, used on its own for continuous monitoring, could have detected 54% of the 1,256 critical incidents, particularly during paediatric anaesthesia²⁴.

Problems associated with vascular access accounted for 1.6% of the incidents in the first report but was not a problem in the second report. Vascular access accounted for 3% of the incidents reported in the Australian Incidents Monitoring Study. The anaesthetist should always question the continued integrity of any vascular access system, even when it has recently been shown to be functioning, and the possibility of problems should always be borne in mind. When there is more than one line, all lines and sites of access should be clearly labelled and checked before anything is injected or infused²⁵. Air embolism was not featured in any of our critical incidents; while in the Australian Incident Monitoring Study there were 19 cases³¹; this may indicate poor detection of this problem by local anaesthetists. Three cases of pneumothorax were reported in the first report but none in the second report, while in the Australian Incident Monitoring Study, 18 cases out of 2,000 incidents involved actual or suspected pneumothoraces. Contributing factors identified from the Australian Incident Monitoring Study included urgency, distorted anatomy, failure to check, and haste on the part of the anaesthetist. The possibility of a pneumothorax must always be considered when unexpected cardiorespiratory deterioration occurs³². Death in the first report⁹ was 2.2% but increased to 6.5% in this second report, compared with 4% reported in the Australian Incident Monitoring study²². One case of awareness was reported in this second report, although 16 cases in which patient recall of perioperative events, consistent with awareness were reported in the Australian Incident Monitoring Study³³. Closer monitoring of patients for awareness during the post-operative visits may be necessary in order not to miss out this important problem. There are also similarities between comparable aspects of the Australian AIMS data and those reported from the USA "closed-claims" studies. For example, the pattern, nature and proportion of the total number of reports is similar for both the USA and the Australian AIMS studies for respiratory complications, recovery room problems and problems arising during paediatric anaesthesia^{13,20,35}.

Factors minimising the occurrence of critical incidents were looked into, and the most important single factor identified in both our reports was prior experience. Regular morbidity and mortality meeting in the

department constitutes an important component in the role of achieving greater safety in anaesthesia practice. In this report only about 7.6% of critical incidents end of morbidity, which may not be reflective of actual state events.

Conclusion

Critical incident reporting is now an accepted technique for reducing anaesthetic morbidity and mortality. It complements existing methods such as case studies during regular morbidity and mortality meetings in many anaesthetic departments. It is highly recommended to be used as a tool for clinical audit at

departmental level. The findings from anaesthesia incident monitoring study can provide detailed qualitative information which can be used to monitor progress in improvement of quality anaesthetic care.

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