

Medication Error in Anaesthesia – A Review

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Abstract

Medication error is a major cause of morbidity and mortality in medical profession . There is an increasing recognition that medication errors are causing a substantial global public health problem, as many result in harm to patients and increased costs to health providers. Anaesthesia is now safe and routine, yet anaesthetists are not immune from making medication errors and the consequences of their mistakes may be more serious than those of doctors in other specialties. Steps are being taken to determine the extent of the problem of medication error in anaesthesia. In this review, incidence, types, risk factors and preventive measures of the medication errors are discussed in detail.

Key words : Medication error, adverse drug event and drug error.

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Introduction

There is a Chinese proverb that “error of one moment becomes the sorrow of whole life”. Medication error is common in health care system and reported to be the seventh most common cause of death overall. Man, medicine and machine are the main contributory factors to it.

The management of anaesthesia has become safe with the advent of newer safe anaesthesia drugs, good quality equipment and high standards of monitoring, but the practice of poly-pharmacy, complex working conditions and involvement of multilevel medical and paramedical staff expose these areas to potentially life threatening medication error at some point of the treatment process.

Although majority of these errors are without any serious adverse outcome but some of them are associated with increased morbidity and mortality leading to prolonged hospital stay, high cost of treatment and potential for litigation¹. The press and public are unforgiving of those perceived to have harmed patients as a result of seemingly basic

mistakes, inattention or carelessness, and equate such mistakes with medical negligence. More than half the public believe that suspending doctors who have committed clinical errors is an effective prevention strategy².

Incidence

Medication errors are common in health care system and reported to be the seventh most common cause of death overall⁴. A total of 2266 members of the Canadian Society of Anaesthesiologists were approached to find out the incidence of medication errors. Surprisingly 30% of them admitted to experience at least more than one error in their lifetime⁵. Japanese Society of Anaesthesiologists (JSA) investigated 27454 anaesthesia procedures over a period of 8 years (1999 – 2007). Out of total 233 incidences of medication error, 6.2% were clerical errors, hence they were not included in the study. Rest were either over-dose (25%), substitution error (23%) or omission error (21%)⁶. A total of 89% of respondents in a survey of anaesthesiologists in New Zealand have admitted to made a drug

administration error at some stage of their career⁷. In a retrospective review of 2000 anaesthetic procedures in Australia, 144 were found to be involved in wrong drug administration⁸. In another study of 55426 cases in Norway, 63 (0.11%) cases of a drug error were found, out of which 3 cases were classified as serious⁹. The Institute of Medicine (IOM) report of India highlights that 44000 - 98000 patients die each year as a result of medical errors, a large portion of these being medication related³.

All these reports are the tip of the iceberg as many cases are not reported due to various reasons like different population variation, clinical practice variation, lack of uniformity in definition, method of reporting and collection of data, fear of blaming and defamation among colleagues etc¹⁴.

What is a medication error?

A medication error is an 'error in the prescription, dispensing, or administration of a

medication with the result that the patient fails to receive the correct drug or the indicated proper drug dosage' (National Library of Medicine Medical Subject Heading). It does not necessarily result in injury. There is wide and sometimes interchangeable use of other terms such as 'prescription error', 'drug error', 'dose error', 'adverse drug event (ADE)', 'potential ADE' and 'preventable ADE', used to define the location of the error in the pathway between pharmacy and patient more precisely or indicate that a patient has been harmed. It is often difficult to compare the results of studies on medication error research when so many different primary outcome measures are used.

The definitions of a variety of different terms used in the research and discussion of drug safety, adapted for relevance to anaesthesia and critical care. Adapted from Wheeler *et al*^{10,11}.

Term	Definition
Medication error	An error in the process of prescribing, dispensing, or administering a drug, whether there are adverse consequences or not.
Adverse drug event (ADE)	An injury related to the use of a drug.
Prescription error	A prescribing decision or written prescription resulting in an unintentional significant: <ul style="list-style-type: none"> – reduction in the probability of treatment being timely or effective <i>or</i> – increase in the risk of harm
Drug administration error	Misinterpretation of correctly written prescription, leading to: <ul style="list-style-type: none"> – administration of the wrong drug <i>and/or</i> – administration of the wrong dose <i>and/or</i> – administration of a drug at the wrong rate <i>and/or</i> – administration of the wrong formulation or concentration <i>and/or</i> – administration by the wrong route <i>and/or</i> – administration at the wrong time <i>and/or</i> – administration to the wrong patient.
Dose error	Administration of the wrong dose of a drug
Adverse drug reaction	Any response to a drug which is noxious and unintended that occurs in doses normally used in man

Risk factors for errors during anaesthesia

Cooper and colleagues have identified several risk factors in a critical incident analysis to study preventable mistakes¹⁶. Maximum errors were due to either inadequate experience (16%) or due to inadequate familiarity to equipment or device (9.3%) whereas haste and inattention or carelessness each amounted to 5.6% errors during anaesthesia.

Risk factors for medication errors in anaesthesia are listed below:

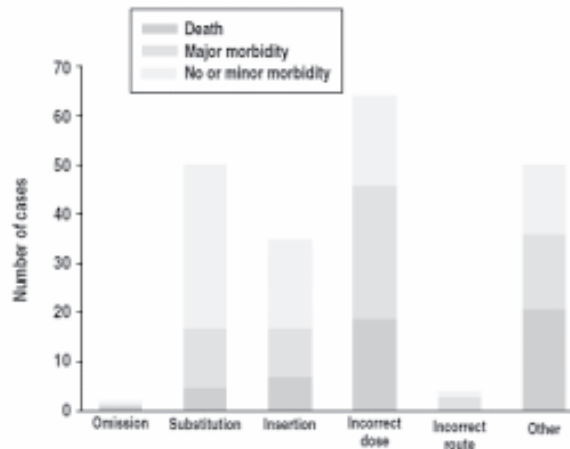
- Unfamiliar settings
- New drug packaging or ampoules
- Similarly appearing ampoules are stored close together in the medication carts
- Syringes prepared by other personnel
- Handwritten labels used
- Poor lighting conditions
- Multiple medications
- Failure to label syringes
- Incorrect matching of labels on syringes/ ampoules
- Failure to read label on vial/ampoule
- Misuse of decimal points/zeroes
- Inappropriate abbreviations
- Hurry
- Fatigue
- Inattention
- Carelessness
- Lack of double checking
- False labeling,
- Lack of checking before loading,
- Performing surgery in emergency setting,
- Poor coordination between staff and Anaesthesiologist.
- Attendant staff not adequately trained.

How Can Prescribing Go Wrong?

- Inadequate knowledge about drug indications and contraindications.
- Not considering individual patient factors, such as allergies, pregnancy, co-morbidities, other medications.
- Wrong patient, wrong dose, wrong time, wrong drug, wrong route.
- Inadequate communication (written, verbal)

- Documentation - illegible, incomplete, ambiguous
- Mathematical error when calculating dosage
- Incorrect data entry when using computerized prescribing e.g. duplication, omission, wrong number

When to suspect wrong drug administration



Number of causes of drug errors classified by the mechanism of error

in the operating room?

- Unusual response or lack of response to drug administration: pounding heart, mental status changes, apnea, muscle weakness, or visual disturbances.
- Extreme or unexpected increase or decrease in blood pressure or heart rate.
- Unexpected or persistent muscle relaxation.
- Unexpected change or lack of change, in level of consciousness.
- Incorrect ampoule found to be open in work area.

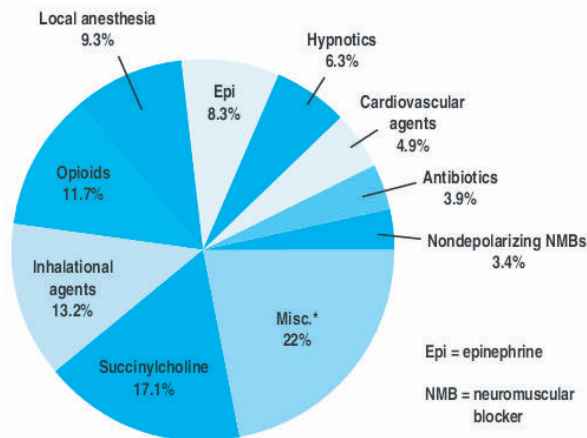
Which Patients Are Most At Risk Of Medication Error?

- Patients on multiple medications
- Patients with another condition, e.g. renal impairment, pregnancy
- Patients who cannot communicate well
- Patients who have more than one doctor
- Patients who do not take an active role in their own medication use
- Children and babies (dose calculations required)

Drugs Involved In Medication Errors

Various group of drugs involved in medication errors during practice of anaesthesia have been reported by different authors. Induction agents like pentothal sodium, ketamine, depolarizing and non-depolarizing muscle relaxants, narcotic and sedatives, anticholinergics, and local anaesthetics have been given wrongly either due to misidentification, wrong labelling, syringe swap, or exchange with another drugs because of inattention or haste. However, in majority of the cases these errors did not result in any serious harm to the patients^{20,17}.

In critical care units, the involvement of inotropes, narcotics, sedatives, analgesics, potassium chloride, magnesium sulphate, and anticoagulants like heparin or anti-infective agents have been identified in different studies^{12,13,18,19}.



Type of drugs involved in drug errorsd

Consequences of Medication Errors

There is an increasing recognition that medication errors are causing a substantial global problem as many results in harm to patients and increased cost to health care providers, and anaesthesia and critical care are no exception to this.

Medical errors are the leading cause of death in USA. A total of 44000 - 98000 Americans die every year. IOM has estimated that each year medical errors injured at least 1.5 million Americans and cost the health system more than 3.5 billion U.S. dollars. In another study approximately 7000 deaths in USA have cost more than 2 billion dollars³.

Medical errors erode not only a patient's but also a family's confidence in health care organisations,

public confidence also suffers due to these errors. The memory of errors can haunt the provider for years. Anaesthesiologists have been charged for manslaughter, homicide, etc⁷.

Prevention of Medication Errors In Anaesthesia and Critical Care

Anaesthesiologists are one of the few groups of physicians who are personally responsible for drug administration. During anaesthesia most drug errors are totally or partially attributed to human error which is an inherent part of human psychology and activity; hence the occurrence of error can only be reduced and not eliminated.

Reporting and learning from medication errors should practice but accident during the period of anaesthesia is often not reported due to fear of being blamed for carelessness, forgetfulness and sometimes character weakness²¹.

In general, following things should be kept in mind while working in the operation room to minimise the incidence of medication errors:

Reducing the complexity of the system to simple and linear to enhance the safety¹⁵. Redundancy and standardisation are the basic principles in the design of a safe system¹⁵. Double checking of ampoules, syringes and equipment before starting the procedure⁹. Simple vigilance during the handling and administration of drugs is of utmost importance.

After a systemic review, Jenson and colleagues recommended a 12-point strategy to prevent medication errors during anaesthesia and critical care^{20,21}.

The label on any drug ampoule or syringe should be read carefully before the drug is drawn up or injected. Legibility and contents of labels on ampoules and syringes should be optimized according to agreed standards with respect to font, size, colour and information. Syringes should always be labelled. Formal organisation of drug drawers and work space should be used with attention to tidiness, position of ampoules and syringes, separation of look-alike drugs and removal of dangerous drugs from the operation room. Labels should be checked specifically with the help of a second person or a device like bar code reader before administration. Error during administration should be reported and reviewed.

Management of inventory should focus on minimising the risk of drug error. Look-alike packaging and presentation of the drug should be avoided where possible. Drug should be presented in prefilled syringes rather than ampoules. Drug should be drawn up and labelled by the anaesthesia provider himself/herself. Colour coding by class of drugs should be according to an agreed national or international standard. Coding of syringe according to position or size should be done.

Conclusion

Despite the best efforts, the increased use of technology and high standards of both invasive and non-invasive monitoring in anaesthesia and critical care, medication errors continue to occur even at the best centres worldwide. Simple vigilance, standardised protocol, and 'think before act' are the key factors to avoid occurrence of medication errors.

References :

- PJ, Gift MG, Lee YP, Rothermich EA, Sill BE. Cost of medication-related problems at a university hospital. *Am J Health Syst Pharm.* 1995;52:2415–8.
- Blendon RJ, DesRoches CM, Brodie M, et al. Views of practicing physicians and the public on medical errors. *New England Journal of Medicine* 2002; 347: 1933–40.
- Kohn LT, Corrigan JM, Donaldson M. Washington DC: National Academy Press; 1999. To err is human: Building a safer health system.
- T, Palmisani S, Scurlock C, Orav EJ, Bates DW. The "To Err is Human" report and the patient safety literature. *Qual Saf Health Care.* 2006;15:1748.
- Orser BA, Chen RJ, Yee DA. Medication errors in anaesthetic practice, a survey of 687 practitioners. *Can J Anesth.* 2001;48:139–46.
- Yamamoto M, Ishikawa S, Makita K. Medication errors in anesthesia: An 8-years retrospective-analysis at an urban university hospital. *J Anesth.* 2008;22:248–52.
- Merry AF, Peck DJ. Anaesthetists, errors in drug administration and the law. *N Z Med J.* 1995; 108: 185–7.
- Mackay P, Morgan C, Runciman WB, Russell WJ. The Australian Incident monitoring study. The "Wrong drug" problem in anaesthesia: An analysis of 2000 incident reports. *Anaesth Intensive Care.* 1993;21:596–601
- Fasting S, Gisvold SE. Adverse drug errors in anaesthesia, and the impact of coloured syringe labels. *Can J Anesth.* 2000;47:1060–7.
- Van Den Bemt PMLA, Egberts TCG, De Jongvan den Berg LTW, Brouwers JRB. Drug-related problems in hospitalised patients. *Drug Safety* 2000; 22: 321–33.
- Allan EL, Barker KN. Fundamentals of medication error research. *American Journal of Hospital Pharmacy* 1990; 47: 555–71.
- Calabrese AD, Erstad BL, Brandl K, Barletta JF, Kane SL, Sherman DS. Medication administration errors in adult patient in the ICU. *Intensive Care Med.* 2001;27:1592–8.
- Id JM, Landrigan CP, Cronin JW, Kaushal R, Lockley SW, Burdick E, et al. The critical care safety study: The incidence and nature of adverse events and serious medical errors in intensive care. *Crit Care Med.* 2005;33:1694–700.
- Camire E, Moyen E, Stelfox HT. Medication errors in critical care: Risk factors, prevention and disclosure. *CMAJ.* 2009;180:936–43.
- Reason J. New York: Cambridge University Press; 1990. Human error.
- Cooper L, DiGiovanni N, Schultz L, Taylor RN, Nossaman B. Human factors contributing to medication errors in anaesthesia practice. *ASA.* 2009:A614.
- Bowdle TA. Drug administration errors from the ASA closed claims project. *ASA Newsl.* 2003; 67: 113.
- A, Booth SA, Thompson CM, Clayton T, Eddleston J, Mackenzie S, et al. Prescription errors in UK critical care units. *Anaesthesia.* 2004; 59: 1193–200.
- Calabrese AD, Erstad BL, Brandl K, Barletta JF, Kane SL, Sherman DS. Medication administration errors in adult patients in ICU. *Intensive Care Med.* 2001;27:1592–8.
- ASHP guidelines on preventing medication errors in hospitals. *American Journal of Hospital Pharmacy* 1993; 50: 305–14.
- World Health Organization. International Drug Monitoring: the Role of the Hospital. WHO Technical Report Series no. 425. World Health Organization 1969.