Medication Errors during Anaesthesia in A Tertiary Health Institution in Nigeria: A case series

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Abstract

Polypharmacy is a routine practice in anaesthesia, hence occurrence of medication errors is not uncommon. A medication error is an error in the prescription, dispensing, or administration of medication which results in failure of patients to receive correct drug or appropriate dose. Such errors usually occur due to human and drugs packaging factors and consequences may range from no harm to morbidity or mortality. This case series highlighted some of the common medication errors that occurred in our center, their causes, interventions and outcomes.

Medication error is a common occurrence in anaesthesia. Similar looking vials, ampoules and syringes and inexperience of the anaesthesia care provider are associated risk factors. Anaesthesia care providers should be vigilant and protected from undue fatigue and overwork because human errors were responsible for all the cases highlighted and discussed.

KEY WORDS: Medication error, Anaesthesia, tertiary health institution, Nigeria

Introduction

Error is a major cause of morbidity and mortality in the medical practice, and anaesthesia is not an exception.[1] Medication errors constitute a threat to patient safety in healthcare services; and the risk of its occurrence is higher in anaesthesia where the use of multiple drugs to achieve balanced anaesthesia is norm rather than exception A recent study has reported occurrence of one medication errors/adverse effect in every 20 administered medication during the peri-operative period.[2] Of these errors, anaesthetics that can cause harm accounted for one third and the remaining two-thirds was due to anaesthetics with potential to cause harm.[2]

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Another study estimated that an anaesthesiologist errs seven times a year, and causes damage to patients twice over a career life[3], representing a high and unacceptably common situations.

It is estimated that an anaesthesiologist injects at least 450 different drugs in his or her professional career.[4] Therefore, the likelihood of occurrence of inadvertent medication errors is very high. Various figures have been quoted for incidences of drug errors in anaesthesia. In a study of two hospitals by Webster et al.[5], an incidence of 1 medication error per 133 administered anaesthetics was reported. Similarly, Sakaguchi et al.[6] reported drug errors in only 50 patients out of 64,285 patients anaesthetized (0.078%) over a 15-year period. Opioids, cardiac stimulants and vasopressors were the drugs mostly involved in the incidents. A South African study reported an incidence of 0.37% (111 incidences for 30412 anaesthetics or 1 per 274).[7]

Several factors have been implicated in the occurrence of medication errors in anaesthesia. Amongst these factors are distraction/fatigue, misread label, pressure to proceed, lack of knowledge or experience, unfamiliar vial or ampoule, inadequate communication among anaesthesiologists, equipment malfunction, equipment not available and improper storage.[8-10]

CASE SERIES

Case 1:

AY, was a 67-year old man ASA II with benign prostatic hypertrophy (BPH) scheduled for open prostatectomy under general anaesthesia (GA). He had no known chronic medical disorder and all laboratory investigations including the electrocardiogram (ECG) were normal.

Anaesthesia was induced with 20mls (1g) of sodium thiopentone, inadvertently constituted as 5% rather than 2.5% solution by a member of the managing anaesthesia team. Short-acting muscle relaxant, 1.5mg/kg suxamethonium was administered without obvious fasciculations. Immediately after placement of endotracheal tube, he was noticed to have cardiac arrest as evidenced by absence of carotid pulse and was successful resuscitated. Thereafter, surgery proceeded as plan and maintenance and emergence phases of anaesthesia were uneventful. He had uneventful recovery and was subsequently discharge to the ward.

Case 2:

BS was a 13-year-old girl managed as a case of acute appendicitis, scheduled for an emergency appendectomy under subarachnoid block (SAB). She had no intercurrent medical illness. Pre-anaesthetic review revealed a young girl who was in moderate pain but otherwise fit for the planned procedure. Her ASA physical status was IIE.

Baseline vital signs in the operating room were normal. Following aseptic preparation of the back of the patient, 2 ml of 0.5% hyperbaric bupivacaine was injected into the subarachnoid space using the L3/L4 interspace. She was positioned supine for the procedure and her vital signs remained stable after establishing the SAB. About 20 minutes after commencement of surgery, she started feeling moderate to severe pain around the umbilicus, and ketamine analgesic supplementation was given to alleviate the pain. However, adrenaline (1mg), instead of atropine was mistakenly added to the mixture of ketamine (100mg) by the registrar anaesthetist in the anaesthesia team. The error was not instantly realized as the preparation was diluted to 5mls. About 45 seconds after 2mls of the preparation was administered, the patient started complaining of headache at which time it was discovered that an adrenaline ampoule was mistaken for atropine ampoule. The patient became apnoeic, unconscious and bradycardic with pulse as low as 52 bpm. One hundred percent oxygen was administered with manual ventilation using a closed circuit breathing system and the patient regained consciousness with return of spontaneous circulation and ventilation within 2 minutes of this event. She was successfully managed, transferred to the ward and subsequently discharged home on the third postoperative day.

Case 3.

FA was a 9-month old ASA II boy with myelomeningocele who underwent repair of the congenital defect under general anaesthesia. He was reviewed preoperatively and found to be fit for surgery. There was no associated congenital cardiac defect. Pre-induction vital signs were normal. After routine anaesthesia machine check, anaesthesia was induced with halothane in oxygen. However, during induction he had sudden cardiac arrest with disappearance of ECG tracing and pulse oximetry, and, absence of femoral artery pulsation. Immediate cardiopulmonary resuscitation was commenced. During resuscitation, it was noticed that the halothane vaporizer's dial was turned anticlockwise giving an overdose of halothane. The vaporizer was turned off and few minutes following active resuscitation, there was return of spontaneous cardiac activity. The patient's trachea was subsequently intubated and surgery proceeded in prone position. After completion of surgery, residual neuromuscular block was reversed with combination of neostigmine and atropine., inhalation agent was discontinued and 100% oxygen administered. The patient was positioned supine and following resumption of spontaneous respiration, he was extubated awake uneventfully. The postoperative course was also uneventful.

Case 4:

TKF was a 13year old ASA I male who had release of contracture and skin grafting of the left hand under general anaesthesia. Preoperatively, vital signs were within normal limits. Anaesthesia was induced with intravenous propofol 2mg/kg and endotracheal intubation was facilitated with intravenous suxamethonium 1mg/kg. Anaesthesia was maintained with controlled ventilation using halothane in oxygen while pancuronium was administered for muscle relaxation. Before skin incision, 1:200,000 adrenaline was requested for by the surgeon to be injected into the surgical site to reduce bleeding. Shortly after the administration of adrenaline, there was absent cardiac activity. Halothane inhalation was immediately discontinued and cardiopulmonary resuscitation was immediately instituted.

Chest compression with ventilation continued for about 10 minutes and patient had 1 mg adrenaline and 1 mg atropine iv with eventual return of spontaneous circulation (ROSCI) as evidenced on the ECG, capnograph and pulse oximetry. Post- ROSCI, the patient continued to have arrhythmias which was treated with iv lidocaine 1.5 mg/kg. Surgery re-commenced with normalization of cardiac rhythm. Search for the cause of the cardiac arrest revealed inaccurate dilution of adrenaline was 1:50,000 instead of 1:200,000 in the presence of halothane. Cerebral hypoxia and possible cerebral oedema was treated with mannitol infusion. The patient was admitted into the intensive care unit without reversal of neuromuscular block and managed as a case of hypoxic encephalopathy secondary to cardiac arrest. He regained full consciousness on the second postoperative day and was discharged to the ward on the 4th postoperative day with good neurological recovery.

Case 5:

O. F, was a 45-year old woman with right ankle fracture of 2 weeks duration who had open reduction and internal fixation under subarachnoid block (SAB). She had no intercurrent medical illness. Physical examination, haematological and blood electrolytes and urea were normal. Following routine check on the anaesthesia workstation, the patient was connected to a multiparameter monitor for base line pulse rate, blood pressure and peripheral oxygen saturation. Intravenous access was secured on the dorsum of the left hand with a 16G cannula and the patient was preloaded with 15

ml/kg of 0.9% saline over 20 minutes. She was placed in the sitting position for SAB. A presumed local anaesthetic solution heavy bupivacaine was withdrawn by a first-year resident anaesthetist after confirmation by an anaesthetic porter. Through the L3/4 interspace, the subarachnoid space was located by confirmation of free flow of CSF, and the solution was injected intrathecally. A minute later, the patient was noticed to have motor paralysis (Bromage score 3) with no sensory loss. During the process of establishing the cause, diclofenac was discovered to have been inadvertently administered from an ampoule in place of heavy bupivacaine due to the indistinguishable similarity in ampoules of the two medications.

Surgery was cancelled; patient was informed and sent back to the ward with persistent lower limb paralysis. She was referred for physiotherapy on the following day, improvement in motor function, from power of grade 2 on both lower limbs to grade 3 was noticed after a month. She was discharged home on the 30th postoperative day and managed on an out-patient basis. On the 3rd month, the power had improved bilaterally. She was later lost to follow up.

Case 6:

A.Y, was a 34-year old woman with symptomatic uterine fibroid had myomectomy under epidural anaesthesia. She had no known drug allergy and no concomitant medical illness. Physical examination was essentially normal. In anticipation of intraoperative bleeding three units of whole blood were prepared for the procedure. Base-line vital signs in the operating room were normal. Intravenous access was secured with a wide bore cannula for pre-hydration with normal saline. Under aseptic procedure, epidural anaesthesia was established in the sitting position with 15 ml 0.5% plain bupivacaine using the L2/3 interspace and the patient positioned supine for surgery. Sensory and motor blockades occurred 20 minutes after injection of the plain bupivacaine. Instead of administering 5 ml top-up of 0.5% plain bupivacaine into the epidural catheter as a top up dose, it was inadvertently administered intravenously. Upon realization of error in the route of administration, patient was closely monitored for changes in his cardiovascular parameters and neurological sequelae throughout the surgery. The monitoring was continued for 2 hours postoperatively in the postoperative care unit (PACU) and the patient was discharged to the ward without any immediate complication.

Discussion

The quality of anaesthesia services has improved significantly in advanced countries due to advent of safer anaesthetic agents, development of better equipment and availability of different modules of anaesthesia training. The scenario is different in most parts of Africa where access to modern, safer drugs and quality of monitoring are limited,[11] heavily dependent on human intervention.

Human performance in the delivery anaesthesia services is never perfect, hence errors of omission and commission may occur. Majority of these errors are without any serious adverse effects, but some may be associated with increased morbidity and mortality leading to prolonged hospital stay, high cost of treatment and litigation.[12] Institute of Medicine reported that 44000 – 98000 die each year as a result of medical errors, a large proportion of which are medication related.[13] These improvements have not been replicated in most parts of Africa, as access to modern equipment; safer drugs and quality of monitoring are severely limited.[12]

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 drug dosage.[14] Medication error rates appear to be higher during day shifts rather than at night.[15] Although, many medication errors go unreported due to a number of

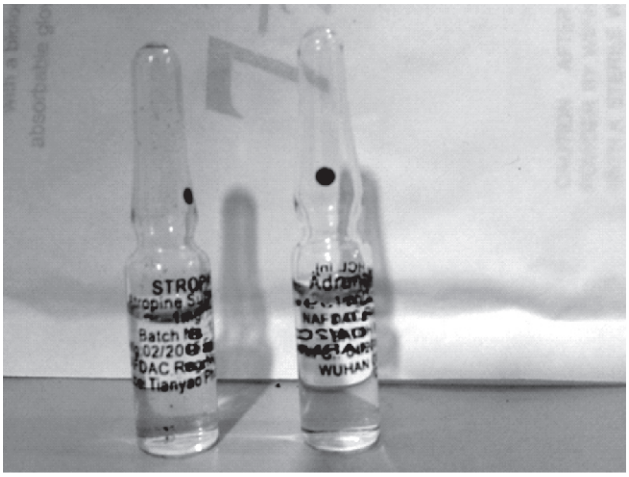

Fig 1: Atropine and adrenaline ampoules demonstrating similarity both in size and labelling.

Fig 2: Diclofenac and Heavy Bupivacaine ampoules

factors such as lack of reporting and data collection format, population variation, lack of a consensus definition of what constitutes error and the avoidance of defamation among colleagues.[16]

There are several categories of drug administration errors, ranging from slips and lapses to fixation errors and violations. One of the main problems is the similarity in packaging, presentations and colour of the drugs as in cases 2 and 5 (Fig 1 and 2). In a study by Webster et al.[5] on frequency and nature of drug administration errors during anaesthesia carried out in New Zealand found that substitution error account for about 60%. Also, study done in South Africa by Llewellyn et al[7] reported that substitution error was the most common error. Of all errors, 36.9% were due to drug ampoule misidentification; of these the majority (64.4%) were due to similar looking ampoules. Likewise, the difference in the appearance between generic and the brand name among manufacturers may expose patients to this untold event. Inexperience might be expected to contribute towards medication errors, but most publications emphasized on prescription error. Cases 1 and 5 of these case series were examples of inexperience which led to medication error. A study by Lesar et al[15] stated that first-year residents are five times more likely to make prescribing errors than those with more experience.

Drug errors were classified by Webster et al[5] into the following categories; (1) omission – drug not given, (2) repetition – extra dose of an intended drug, (3) substitution – incorrect drug instead of the desired drug, (4) insertion – a drug that was not intended to be given at a particular time, (5) incorrect dose – wrong dose of an intended drug, (6) incorrect route - wrong route of an intended drug. In these reported case series, case 1 was an example of incorrect dose which was due to inexperience of the anaesthesia provider. Case 2 was substitution (adrenaline) instead of the desired drug (atropine), cases 1,3&4 were errors of over dosage, case 5 was insertion while case 6 was incorrect route. Study by Sakaguchi et al.[6] found that wrong medication was the most common type of drug error (48%) occurring perioperatively, followed by overdose (38%), incorrect administration route (8%), under dosing (4%) and omission (2%).

In 1993, there were standards for drug labelling in the USA, Canada, and South Africa.[17,18] This was meant to reduce the occurrence of medication errors. It was noted that 80% of medication errors in the hospitals were caused by human errors, the remainder were due to equipment failures.[19] A study conducted by Rotimi et al[11] showed that errors in anaesthetic practice were frequently caused by 'look-alike' drug labels as in cases 2 & 5, and wrong labelling of syringes. The practice of colour coded syringes should be instituted in anaesthetic practice in order to reduce error in medications. The use of specific colours are now being used to differentiate anaesthetic medications according to an agreed national standard.[20]

Other risk factors of drug error in anaesthetic practice are fatigue and distraction. Therefore, anaesthetists should not be overworked in their respective practice and should be provided with a conducive working environment.

Conclusion

Medication error is a common occurrence in anaesthesia. Same look vials, ampoules and syringes and inexperience of the anaesthesia care provider are associated risk factors. An anaesthetist should be vigilant and protected from undue fatigue and overwork. A tired anaesthetist is a deadly anaesthetist to the patient.

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