



## CASE REPORT

# Accidental IV administration of epinephrine instead of midazolam at colonoscopy<sup>☆</sup>



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### KEYWORDS

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**Abstract** Drug administration errors appear to be a major source of iatrogenic harm to hospitalized patients. They often, particularly in the case of epinephrine, have catastrophic consequences both for the patient and the well-meaning provider. The following incident is a medication error case report which illustrates one way that incorrect medication may be administered. IV epinephrine was accidentally administered instead of midazolam at colonoscopy.

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### 1. Case report

A 50-year-old female presented to our hospital with a history of one month's abdominal pain and altered bowel habit. Colonoscopy was performed using standard sedation (pethidine 50 mg and midazolam 5 mg). The patient complained of chest oppression and respiratory difficulty. She became restless and developed generalized tremors. A medication error was discovered. An epinephrine ampoule, 0.25 mg, had been

accidentally administered IV instead of midazolam. The procedure was terminated and the colonoscope was retrieved. Patient assessment showed that all of the symptoms had been transient. Pulse oximetry readings revealed normal pulse, blood pressure and oxygen saturation. ECG and kidney function tests were normal. The patient was retained in hospital and was followed for 48 h without adverse event. Colonoscopy was repeated a few days later and the patient was discharged from the hospital.

A staff meeting was called to analyze why and how this error had occurred. Both ampoules were of the same size and color and had been placed next to each other during the management of a previous patient with acute upper gastrointestinal bleeding. After the procedure, the epinephrine ampoule was accidentally placed in the box with the midazolam ampoules due to their similar appearance (Fig. 1). An investigation of procedure performance was undertaken and the quality of the endoscopy service was revised. Corrective actions were undertaken. The endoscopist should look at the drug label on each ampoule before administering it. Review

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**Figure 1** Epinephrine ampoule and midazolam ampoule.

of drug containers and their contents should be performed on a regular basis. Hand-written labels were changed.

## 2. Discussion

Medication error is a preventable event that may lead to inappropriate medication use or patient's harm which can contribute to an undesired outcome of patients.<sup>1</sup> These medication errors may put patients at risk of increasing morbidity and mortality.<sup>2</sup> Furthermore, the confidence of the patient's in health care system may decrease and a great burden of cost would be imposed on the patients.<sup>3</sup> In Australian hospitals about 1% of all patients suffer an adverse event as a result of a medication error.<sup>4</sup> Abbasinazari et al. assessed the frequency of medication errors in internal wards of a teaching hospital over a two-month period.<sup>5</sup> Two hundred and sixty-two errors were detected in 132 patients (1.98 per each). The

**Table 1** Causes of medication administration errors.

Causes	Examples
<i>Unsafe acts</i>	
Slips and lapses	Misidentification of medication or a patient. Misreading a medication label, prescription or other documentation. Selection of a wrong medication. Failure to administer a drug. Carelessness
Knowledge- and rule-based mistakes	Inadequate knowledge of medication
Violations	Situational violation (those arising due to necessity e.g. poorly designed protocols or lack of staff). Violation limited predominantly to data collection method (conversation with subjects to determine error causality)
Other unsafe acts	Calculation errors. Faulty checking activities. Not following instructions
<i>Local workplace factors</i>	
Patient factors	Availability (absent/sleeping patients during drug administration rounds). Acuity (wrong time or dose omission due to severity of patient illness). Patient behavior (non-cooperation)
Policies and procedures	Failure in following policy/procedures. Absence of a policy. Over-laborious or generally unsuitable policies. Inadequate procedures
Ward based equipment	Access (insufficient equipment used to aid drug administration e.g., gloves. Lack of access or misplacement of drug charts). Functionality (un-calibrated or malfunctioning equipment e.g., infusion pumps. Ambiguous equipment design e.g., syringe driver or drug packaging)
Staff health status and personality	Physical feelings of fatigue, tiredness/sleep deprivation, sickness and general discomfort. Physical exhaustion due to long hours and lack of breaks/food. Mental state (stress, boredom, nervousness [with being busy and young] and poor mood). Personality (lack of assertiveness/confidence, error perception and conscientiousness)
Training and experience	Insufficient experience (unfamiliar with the medication, environment, procedures or equipment). Inadequate training (the practicalities of preparing and administering medication, inappropriate assessment of intravenous drug administration skills)
Communication	Poor communication. Difficulty with written communication (illegible and unclear/messy prescriptions). Inadequate written communication (prescriptions, documentation, transcription). Problems with labeling
Supervision and social dynamics	Poor supervision by senior colleagues. Apparent overconfidence in/from other nurses when carrying out independent checks. Pressure from other staff members. Confronting and intimidating behavior. Social isolation from colleagues
Interruptions and distractions	Interruptions (conversations, phone calls and patient acuity). Distractions (ward rounds or face-to-face/telephone conversations with co-workers/patients)
Workload and skill mix	Heavy staff workload (end of shift/patient transfer pressures, patient load and multitasking). Skill mix (a lack of qualified staff, working with inexperienced or new staff members and short staffing)
General work environment	Unsuitable environment (noise, lighting, emergencies and busy or chaotic working environments)
Medicines supply and storage	Medication unavailability (lack of ward stock, misplaced medication or lost on the ward). Pharmacy department problems (delayed deliveries, incorrect dispensing and unavailable stock)
Local working culture	Bad practices (administering medicines without a prescription). Exhaustion (due to working double shifts or not taking breaks). Levels of trust between colleagues
<i>Organizational decisions</i>	
High level/strategic decisions	Lack of hospital policy. Misguided policy (low nurse staffing). Poor respond of supervisory teams to errors

frequencies of identified errors were as followed: wrong frequency (27%), forget to order (14.1%), wrong selection (12.5%), drug interactions (9.9%), forget to discontinue (9.5%), inappropriate dose adjustment in renal impairment (9.5%), under dose (6.1%), overdose (5.7%) and lack of monitoring (5.3%).<sup>5</sup>

Medication errors can occur at any of the three steps of the medication use process: prescribing, dispensing and administration.<sup>6</sup> Medication administration appears to be associated with the greatest number of medication errors, whether harm is caused or not.<sup>7</sup> Recent systematic reviews of medication administration error prevalence in healthcare settings found that they were common, with one reporting an estimated median of 19.1% of 'total opportunities for error' in hospitals.<sup>7</sup> The key to implementing a successful intervention that minimizes medication administration errors is to understand why and how they occur.<sup>7</sup> The origins of medication administration errors are multifactorial. The causes of medication administration errors in hospital setting include unsafe acts, local workplace factors and organizational decisions (Table 1).<sup>7</sup>

We report a medication administration error in endoscopy unit. Epinephrine was accidentally administered intravenously instead of midazolam at colonoscopy. The error was due to problem with medicine storage, misplaced medication, misreading a medication label and wrong selection. The error resulted in intervention (hospital admission and monitoring) but did not result in harm or death. Measures were instituted in order to avoid such accident happening again. Drug administration errors appear to be a major source of iatrogenic harm to hospitalized patients. They often, particularly in the case of epinephrine, have catastrophic consequences both for the patient and the well-meaning provider.<sup>8</sup> Many adverse effects have been reported including cardiac ischemia, acute myocardial infarction, respiratory arrest, ventricular dysrhythmias, coronary artery spasms, and fatal intracranial bleeding.<sup>8</sup> Drug administration errors involving epinephrine were particularly dangerous, with death or major morbidity resulting in 11 of the 17 epinephrine-related cases.<sup>9</sup> Six of the 17 cases involving epinephrine were caused by ampoule swaps where epinephrine ampoules were confused with ampoules of the intended drugs. Drugs that were interchanged with epinephrine were ephedrine (two cases), pitocin (three cases) and hydralazine (one case).

Human error is inevitable.<sup>10</sup> Errors occur in all institutional settings.<sup>11</sup> Medication errors are a frequent problem in all phases of medical care, from outpatient clinics, pre-hospital and hospitals.<sup>9</sup> The identification and reporting of medication administration errors is a nonautomated and voluntary process.<sup>12</sup> Error reduction requires a process of detection (error reporting systems), enhancing error reporting, no blame culture, root cause analysis, intervention (training, revised procedures, routine checks, engineering safety solutions and monitoring) and learning from past events-medication errors. Institutions should develop error prevention strategies to target common contributors of medication administration errors

such as improving communication, the use of technology and development of policies for high-risk medications.<sup>13</sup> Increased awareness and education of staff about organizational and human factors is crucial in the prevention of medication administration errors. Organization's safety culture is necessary to minimize errors in future.

### 3. Conflict of Interest

None declared.

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