Medications used in the Operating Room (OR) are often prescribed, prepared and administered by the same individual and this can limit the opportunities for detection of an error before it reaches the patient. Even when a second practitioner in the operating room administers a medication, it is often in response to a verbal order, and verbal orders are known to increase potential for error. The inadvertent administration of a neuromuscular blocker to a non-intubated patient has been reported in the past; in several cases the outcome was catastrophic. The majority of reports describe errors with neuromuscular blockers in patient care areas that are outside of the OR.

ISMP Canada has received four reports of inadvertent administration of a neuromuscular blocker to non-intubated patients in the OR. In all cases, the ensuing respiratory compromise was treated without subsequent complication. Information about these incidents was voluntarily provided to ISMP Canada to develop and promote recommendations for prevention. To our knowledge there have been no case reports in the medical literature describing such errors in the OR setting. However, correspondence with anesthesiologists suggests that substitution errors in the OR involving neuromuscular blocking agents are not as uncommon as previously believed.

The first report describes the sudden development of respiratory compromise in a patient undergoing a minor surgical procedure requiring only local anesthesia and sedation. Immediate interventions included intubation and ventilatory support. The patient required ventilation for approximately 10 minutes. The anesthesiologist later surmised that the neuromuscular blocker, atracurium, might have been administered to the patient instead of the intended midazolam. That the atracurium and midazolam vials were both 10 mL in size and located adjacent to each other in the anesthesia drug cart supports the possibility that such an error could have occurred.

Contributing factors to the error as identified by the hospital included (i) the proximity of midazolam and atracurium vials in the anesthesia drug cart; (ii) the substitution of rocuronium (a commonly used neuromuscular blocker in a 5 mL vial) with atracurium (10 mL vial) in the anesthesia drug cart due to a national (manufacturer) shortage of rocuronium. [Practitioners at this hospital were presumably accustomed to having the neuromuscular blocker in the smaller 5 mL vial and the midazolam in a 10 mL vial. Such familiarity can lead to assumptions that can facilitate human error when one ‘sees’ what the mind ‘expects’ to see – this phenomenon is described as confirmation bias].

The second error report describes the inadvertent administration of rocuronium from an unlabelled pre-filled syringe located on the top of an anesthesia drug cart. The intended drug was a sedative. The patient was successfully resuscitated after suffering a respiratory arrest.

In a third report a patient developed cardiac dysrhythmias and respiratory compromise as he was being prepared for an elective procedure under local anesthesia with sedation. It was discovered that 1mL (10 mg) of rocuronium had been accidentally administered instead of midazolam. The patient was intubated and treated with a cholinesterase inhibitor (i.e. a neuromuscular blocker antagonist – commonly known as muscle relaxant “reversal”). The surgery was rescheduled.

The fourth error report is similar to the above reports. After receiving medications intended to provide (conscious) sedation anesthesia, a patient appeared "floppy" and exhibited signs of neuromuscular weakness. (In anesthesiology, "floppy" is used to describe the appearance of emerging / conscious patients who still have (pharmacologically) impaired function at their neuromuscular junction. Clinically the patients appear weak and their purposeful attempts at movement cause them to appear like "fish out of water"). It was discovered that a neuromuscular blocker had been inadvertently administered instead of the intended midazolam.

In addition, ISMP Canada has received one report of a ‘near miss’ with a neuromuscular blocker in the OR. An anesthesia resident prepared one syringe containing fentanyl and a second syringe containing rocuronium. The attending anesthesiologist discovered that both syringes had been labelled as containing fentanyl and the syringes were therefore discarded and new syringes prepared.

The following recommendations for preventing error-induced injuries with neuromuscular blockers in the OR have been developed with input from several anesthesiologists:

1. When preparing syringes of medication for use during anesthesia:
   - Label all syringes even when only one product is needed:
     - Identify the desired medication/vial required for a procedure and withdraw the desired volume into a syringe. Leave the vial on the workspace and immediately label the syringe barrel. Do not label the needle cap or plunger.
     - Consider using standard printed labels available from medical suppliers. Some anesthesiologists securely affix each label with clear tape as an additional precaution to prevent the labels from falling off the syringe. See also number 5 below.
     - Place the label around the syringe barrel so that the label can be seen regardless of orientation (this may require a second label)
     - Discard the (empty) vial only when the preceding has been completed. [It is noted that some anesthesiologists advocate for keeping a small container with used vials on the workspace, until completion of surgery, in the event that a verification

A medication safety collaborative has been established between the Canadian Anesthesiologists Society (CAS) and ISMP Canada. One of the identified goals is to develop a specific medication safety self-assessment tool for operating rooms. The project will be preceded by a review of selected hospital operating rooms for the purpose of identifying the drug safety issues amenable to system improvements. Consultants from CAS, ISMP Canada and ISMP US will participate in this initiative.
To report a medication error to ISMP Canada: (i) visit our website in-house newsletters or other internal communications only. Reproduction by any other process is prohibited without permission from ISMP Canada. Permission is granted to subscribers to use material from ISMP Canada in writing. ISMP Canada is a national voluntary medication incident and ‘near miss’ reporting program founded for the purpose of sharing the learning experiences from medication errors. Implementation of preventative strategies and system safeguards to decrease the risk for error-induced injury and thereby promote medication safety in healthcare is our collaborative goal.

To report a medication error to ISMP Canada: (i) visit our website www.ismp-canada.org or (ii) email us at info@ismp-canada.org or (iii) phone us at 416-480-4099. ISMP Canada guarantees confidentiality and security of information received. ISMP Canada respects the wishes of the reporter as to the level of detail to be included in our publications.

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