

Medication errors involving NMBAs

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Medication errors involving neuromuscular blocking agents (NMBAs) are potentially serious and life-threatening because these agents paralyze respiratory muscle and, if misused, can adversely affect respiratory function. NMBAs should be administered only by staff with experience in maintaining an adequate airway and respiratory support in facilities where intubation can readily be performed, oxygen can be administered, and respiratory support can be provided.

Between January 2000 and March 2003, 246 medication error records involving NMBAs were reported to the United States Pharmacopeia's MEDMARX database. Most of the errors did not result in harm, and none of the reported errors resulted in death. Nevertheless, 17% of errors reached the patient and required monitoring to confirm that the error resulted in no harm to the patient or required intervention to preclude harm. Another 10% of the errors may have contributed to or resulted in temporary harm to the patient and required either intervention or prolonged hospitalization.

Types of error

There were 187 MEDMARX records in which at least one type of error was identified, with a total of 202 types of error selected (more than one type of error was involved in some cases). The most common types of error were improper dose/quantity and unauthorized drug, both of which accounted for 32% of the 202 types of error selected (see table).

Contributing causes, factors

At least one cause of error was identified in 211 records in the MEDMARX database, with 395 causes of error selected (more than one cause of error was identified in many cases). The single most common cause was performance (human) deficit, identified as a cause of error in 45% of records involving NMBAs. Other common causes of error were: procedure/protocol not followed (19%); calculation error (13%); knowledge deficit (12%); communication (11%); and drug distribution system (10%).

In 53 MEDMARX records, 79 contributing factors were identified. Distractions were identified in 49% of the 53 records. Emergency situation and increased workload each contributed to errors in another 21% of cases. Inexperienced staff was thought to contribute to the error in eight (15%) cases.

•*Case example:* An order was written for Norcuron (vecuronium) and re-

layed to the pharmacy by the nurse, using a telephone. The pharmacy prepared an admixture of norepinephrine, which was sent to the nursing unit and administered. The patient's systolic and diastolic blood pressures increased to 198 mm Hg and 85 mm Hg, respectively. The blood pressure elevation was corrected by giving two doses of hydralazine 5 mg by IV push and labetalol 10 mg by IV push.

Recommendations

To improve the safe use of NMBAs:

- Store NMBAs separately from other medications.
- Limit the availability of NMBAs to the pharmacy and those selected patient care areas where mechanically ventilated patients are treated.
- Do not allow NMBAs to be stored in a multicassette, automated dispensing device drawer. The NMBA storage bin/drawer should allow access to a single item only.

Types of error in MEDMARX records involving neuromuscular blocking agents

Types of error	Percent*
Improper dose/quantity	32
Unauthorized drug	32
Wrong drug preparation	13
Omission error	9
Prescribing error	7
Wrong administration technique	5
Wrong time	4
Wrong patient	3
Extra dose	2
Wrong dosage form	2
Wrong route of administration	1

* The percentages do not add up to 100% because more than one type of error was involved in some cases. There were 202 types of errors identified in 187 MEDMARX records.

- Require that a brightly colored alert label stating WARNING: PARALYZING AGENT appear on all syringes or infusion containers prepared by the facility.
- Review the prescribing practices for ordering NMBAs, and establish automatic discontinuation orders when the patient is transferred out of critical care areas.
- Educate healthcare professionals who administer neuromuscular blocking agents about the usual dosages and institutional policies and procedures for safe handling of these medications.

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USP operates two complementary reporting programs: the Medication Error Reporting Program, presented in cooperation with the Institute for Safe Medication Practices, and MEDMARX. For more information on how to report errors, visit: www.usp.org/patientsafety.