

Medication Errors in Pediatric Patients After Implementation of a Field Guide with Volume-Based Dosing

Background: Several studies have demonstrated the high frequency of medication errors in pediatric patients by prehospital providers during both patient care and simulation. In 2015, our hospital-based urban EMS system introduced the Handtevy™ Field Guide that provides precalculated pediatric doses in milliliters (mL) by patient age. We hypothesized that implementation of the Field Guide would increase the percentage of correct pediatric medication doses to greater than 85%.

Methods: We performed a single center retrospective cohort study of medications administered to patients < 13 years of age from August 2017 – July 2019 compared to 2014 baseline data through electronic medical record review. We excluded nebulized medications and online medication direction cases. Our primary outcome was the percentage of correct doses defined as a dose within 80-120% of the Field Guide dose recommendation. Each dosing error was reviewed by two investigators.

Results: We analyzed 483 drug administrations in 375 patients for the Field Guide study period. Doses were correct in 89.4% of medication administrations with 68.5% reportedly administered exactly as dictated by the Field Guide compared to 51.1% in the baseline period. ($p < 0.001$) During the Field Guide study period, the following medications had 100% appropriate dosing: adenosine, dextrose 10%, diphenhydramine, epinephrine 1:10,000, glucagon, naloxone and oral ondansetron. Overdoses accounted for 4.4% of medication errors and underdoses accounted for 6.2% of medications errors. The most overdosed medications were intranasal (IN) midazolam (11.8%) and intravenous fentanyl (9.4%). The most underdosed medications were IN midazolam (23.5%) and intramuscular epinephrine 1:1000 (12.5%). The highest percentage of errors (20%) were seen in the zero to one-year-old age group.

Conclusion: After implementation of a precalculated mL dose system by patient age for EMS providers, most pediatric medications were reportedly administered within the appropriate dose range. A field guide with precalculated doses (in mL) may be an effective tool for reducing pediatric medication dosing errors by EMS providers.