Optimization of Rocuronium Pharmacokinetics in the Pediatric Operating Rooms: A Quality Improvement Initiative

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Background

The airway of a pediatric patient has a number of significant differences when compared to the adult airway and presents some unique challenges.

This quality improvement (QI) initiative was developed based on anecdotal accounts that the rocuronium bromide at our institution is inconsistent in generating optimal neuromuscular blockade for intubation at appropriate dosing. One concern is that the rocuronium stored in medication carts may be subjected to consistently higher than normal ambient temperatures in the pediatric operating rooms, contributing to decreased medication efficacy.

We hope to ensure consistent and reliable muscle relaxation to successfully intubate neonates, infants and children after an appropriate dose of rocuronium, which will improve the quality and safety of the care we deliver to this population.

Aim

The aim of this QI initiative is ensure optimization of the time to maximal neuromuscular block, as measured by Train of Four (TOF) stimulation, to less than 180 seconds following a single dose of 0.6 mg/kg of rocuronium in 95% of children as is expected by published pediatric pharmacokinetic studies1,2.

Methods

• 35 pediatric patients were included in our study. Patients were excluded if >95% or <5% weight for age, on seizure medications, history of liver disease, active left to right shunt or neuromuscular disease that would impact onset of NDMB.

• We measured the number of twitches at the adductor pollicis using TOF stimulation via a peripheral nerve stimulator every 15 seconds following a 0.6mg/kg single dose of rocuronium.

• Quality metric: number of seconds until loss of four twitches (maximum 300)

• The first 20 patients received a dose of rocuronium from a vial stored in the medication cart. The subsequent 15 patients received a dose of refrigerated rocuronium directly from the pharmacy.

Results

The median number of seconds until loss twitches in both our pre-intervention and post-intervention data was 195.

Within the pre intervention group, 12/20 patients (60%) had loss of twitches >180 seconds, and 3 (15%) continued to have twitches at >300 seconds. In the post intervention group, 9/15 patients (60%) had loss of twitches >180 seconds, and 0 had twitches at >300 seconds.

Rocuronium bromide stored in medication carts in the pediatric operating rooms at our institution does not behave as described in the literature, but it does not appear that refrigeration of rocuronium reduces the time to maximal neuromuscular block.

We intend to investigate other causes of this discrepancy between the pharmacokinetic data published in the literature and our experience with this medication.

Conclusion

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References