

Severe Clonidine Toxicity After Caudal Block in a 6-Month-Old Infant

Medication Swap Reveals System Vulnerabilities in Pediatric Regional Anesthesia

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Introduction

Medication errors in pediatric regional anesthesia pose significant safety risks due to low-weight dosing, diverse adjunct agents, and workflow complexity. We present a case of severe clonidine toxicity in a 6-month-old infant following a caudal block in which clonidine and bupivacaine were inadvertently reversed during preparation. This review identifies contributing system factors and improvement opportunities within a large pediatric surgical network.

Case History

A healthy 6-month-old 7.59 kg male undergoing penile torsion repair received a caudal block with an incorrectly prepared solution containing 7 mL of clonidine instead of bupivacaine. The child developed progressive somnolence, bradycardia, hypoventilation, and hypothermia, requiring intralipid therapy, epinephrine boluses, respiratory support, repeat IV access, and PICU admission. A markedly elevated clonidine serum level (8.6 ng/mL) was obtained. The patient returned to neurologic baseline within 24 hours and was discharged home. Identified contributing factors included inconsistencies in clonidine vial appearance between sites, potential distraction during medication preparation, and lack of standardized regional anesthesia medication workflows.

Medication Error: System Vulnerabilities

1. Medication Vial Similarity
- Clonidine and bupivacaine vials had similar size and labeling layout
 - Manufacturer variability resulted in different packaging between sites
 - Storage bins placed medications in close proximity

2. Non-standardized Medication Preparation
- Medication preparation often occurred individually at anesthesia carts
 - No standardized regional anesthesia medication kit
 - Variable use of double-check verification

3. Environmental and Workflow Factors
- Medication preparation occurred during induction workflow
 - Multiple concurrent tasks increased cognitive load and distraction

4. Supply Chain Variability
- Inconsistent manufacturers for clonidine and local anesthetics
 - Changes in vial appearance over time
 - Lack of centralized pharmacy preparation

Medication Safety Action Plan

Detecting Similar Safety Risks
System-wide medication safety assessment, including medication Look-Alike / Sound-Alike Review

Cross-Campus Standardization Review Evaluation and Error Prevention:

1. Standardized Pharmacy-Prepared Regional Kits
- Development of pre-assembled caudal block kits containing:
- Pre-labeled medications
 - Standard concentrations
 - Consistent preparation workflow

2. Standardized Medication Labeling
- Color-coded labels for regional anesthesia medications
 - Large-font drug name labeling
 - Standard syringe labeling templates

3. Independent Medication Verification
- Mandatory two-provider verification before regional injection
 - Verbal confirmation of drug, concentration, and dose

4. Medication Storage Redesign
- Physical separation of clonidine and local anesthetics
 - Distinct storage bins with warning labels
 - Removal of nonessential medications from anesthesia carts

5. Supply Chain Safety Planning
- Pharmacy review of incoming medication packaging changes
 - Notification to anesthesia providers when vial appearance changes

When shortages occur:

- Temporary visual alerts placed on anesthesia carts
- Updated Look-Alike / Sound-Alike Review



Safety Framework: Checklist

RN Challenge	Anesthesiologist Response	RN action
ID	Matches Consent	Reads Wrist Band
Surgical Consent	Read Surgical Consent	
Surgical Site	Matches Surgical Site to Consent	Identifies Surgical Site Mark
Anesthesiology Consent	Read Anesthesiology Consent	
Block Type	State Block Type	
Site Marking Form	Matches Anesthesiology Consent	Identifies Block Site
Allergies	No, or Yes and Specify	
Anticoagulation	No, or Yes and Specify	
Skin prep restriction	No, or Yes and Specify	
Medication	State Medication and Dose	View, Verify Med(s), Dose, Expiration
Max dose	State Max Dose	Confirm Local to Surgical Field
Any Concerns ?	STATE CONCERN	

Discussion

This case underscores the high potential for harm from medication swaps in regional anesthesia, particularly with potent adjuncts like clonidine. While full recovery occurred, the severity of toxicity highlights the need for standardized pharmacy-prepared caudal kits, consistent labeling and packaging across campuses, and structured medication verification steps. Integrating these findings into division-wide quality and safety initiatives provides opportunities to substantially reduce risk in pediatric regional anesthesia practice.

References

Gummin DD, Mowry JB, Beuhler MC, et al. 2021 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 39th Annual Report. *Clin Toxicol (Phila)*. 2022;60(12):1381–1643.

Eisenach JC, De Kock M, Klimscha W. α2-Adrenergic Agonists for Regional Anesthesia: A Clinical Review of Clonidine. *Anesthesiology*. 1996;85(3):655–674.

Walker BJ, Long JB, Sathyamoorthy M, et al. Complications in Pediatric Regional Anesthesia: An Analysis of More Than 100,000 Blocks From the Pediatric Regional Anesthesia Network. *Anesthesiology*. 2018;129(4):721–732.