



Pediatric
Critical Care
Learning



PCCL Session: Summary Report and Resources

PCCL session topic: *“Blocker Shocker – A Case of Toxic Ingestion”*

Date: February 20, 2026

Learning objectives:

1. Review an approach to pediatric bradycardia and hypotension.
2. Describe an approach to the management of a calcium channel blocker overdose.
3. Discuss how a concurrent beta blocker overdose would modify management.

Case:

- Care Context:
 - Community hospital with high acuity peds beds and adult ICU.
- Patient Demographics:
 - Age: 15 years, Weight: 40 Kgs
 - Previously healthy, normal development, fully immunized, no regular medications.
- Initial Presentation:
 - Disclosed ingestion of 125 mg carvedilol and 240 mg of amlodipine previous evening
 - Presented to emergency department complaining of chest pain and dizziness, nausea vomiting.
- Initial Management:
 - Presented with **low BP (62/39), HR 73**, RR 16, Sat 95%, Temp 36.4, cap refill 3 sec
 - GCS 15, pulses palpable, bradycardia on exam given BP. Resp, MSK, and neuro exams grossly normal. Postural hypotension symptoms.
 - Called poison control, started fluid bolus (20cc/kg), calcium gluconate and called pediatrics on call.
 - Recommended 3X Ca Gluconate but not insulin, citing the type of calcium channel blocker (amlodipine) as the reason to withhold
 - Developed worsening hypotension and bradycardia. Epinephrine infusion started and 40 ml/kg fluid bolus given. Moved to peds ward.
- Investigations:
 - WCC 11.2 (neut 10), Cr 180, Ur 11.1, CRP < 0.16, lactate 1.9, glucose 8.8-9.3.
 - ECG sinus brady.
 - Etoh, acetaminophen and salicylate negative.
- Early Management:
 - BP remained low on epinephrine (80/40s) but with good peripheral pulses. Mentating well, good urine output, decreasing creatinine, ambulating to toilet.
 - Follow-up with poison control: duration of meds hard to predict, recommended continuing current supportive management (no further Ca gluconate or initiation of insulin) and to wean inotropes as able.



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- Clinical Deterioration (22 hours post ingestion):
 - Worsening hypotension – epinephrine increased and norepinephrine initiated.
 - Multiple fluid boluses (2 x 1L).
 - PICU and toxicology involved remotely with adult ICU in person. Recommended starting insulin infusion, giving glucagon, and a bolus dose of methylene blue.
 - Sodium bicarbonate infusion started for metabolic acidosis, intubated with rocuronium and ketamine and arranged transfer to BCCH PICU.
- Definitive Management: Admitted to BCCH PICU

Learnings:

Calcium Channel Blockers (CCB)

- Two types
 - Dihydropyridine (e.g., amlodipine) CCBs: predominant effect is vasoplegia and hypotension, may initially have normal or elevated HR (compensatory).
 - Non-dihydropyridines (verapamil, diltiazem): predominant effect is on electrical conduction and myocardial depression leading to hypotension, bradycardia.
 - At higher doses, CCB lose selective effects and cause severe myocardial depression, bradycardia, and hypotension
- Other symptoms
 - Hyperglycemia (classic CCB toxicity marker) due to decreased pancreatic insulin secretion and insulin resistance, contributes to impaired myocardial energy uptake
 - GI symptoms: nausea/vomiting.
 - CNS depression possible in severe cases.

Beta Blockers (BB)

- Predominantly cause bradycardia and hypotension, which may be multifactorial due to vasoplegia (alpha-1 antagonism) and myocardial depression
- Specific effects dependent on the mechanism of action of beta blocker types
 - Propranolol may present with CNS effects (delirium, seizure, coma) due to lipophilic properties and increased transport across the blood-brain barrier
 - Potassium-channel blockers (e.g., sotalol) may be associated with prolonged QTc, torsades des pointes
 - Sodium-channel blockers (e.g. carvedilol, propranolol) may be associated with widened QRS, monomorphic ventricular tachycardia
 - Peripheral vasodilators (e.g., labetalol) present with profound vasoplegia

Initial Assessment & First-Line Management for this type of Overdose

- Obtain detailed history of ingestion
- Urgent consultation with BC Poison Control
- Consider activated charcoal if appropriate timing (e.g., within 1-2 hours of ingestion)



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- Continuous cardiorespiratory monitoring; effects may be prolonged for extended-release formulations
- Obtain peripheral IV and/or IO access, with consideration for central line placement if resources permit
- Administer fluid resuscitation.
- Calcium administration (calcium chloride or calcium gluconate) to improve availability of intracellular calcium for contractility.
- Vasoactive medications:
 - Higher-than-usual doses may be required, titrate to effect. Choice of initial vasoactive may depend on initial clinical presentation
 - Norepinephrine if predominant vasoplegia
 - Epinephrine if predominant myocardial depression and bradycardia
 - Often, both are required due to severe, refractory hypotension and bradycardia
 - [Low-Dose Bolus Epinephrine](#) (10 mcg/ml) is used for rapid, temporary BP support in peri-intubation hypotension, shock, and deterioration while awaiting vasopressor infusions.
 - [Code \(Standard\) Epinephrine](#) (100 mcg/ml) is used for cardiac arrest
 - Preparation before intubation:
 - Optimize hemodynamics as able before sedation to avoid cardiovascular collapse.
 - Important reminder that mentation does not equal hemodynamic stability in children.
- Intubation used to:
 - Reduce metabolic demand.
 - Allow safe administration of therapies.
 - In anticipation of transport

High-Dose Insulin Euglycemia Therapy (HIET)

- Rationale:
 - CCB toxicity → ↓insulin secretion + insulin resistance.
 - Myocardium becomes unable to utilize glucose → HIET restores carbohydrate metabolism.
- Controversy in amlodipine:
 - Insulin is a vasodilator, so may worsen vasoplegia initially.
- [Guidelines \(2023\)](#) recommend HIET when escalating inotrope doses are required.
- Dosing notes from discussion:
 - Bolus 1 unit/kg insulin.
 - Concurrent dextrose (0.5 g/kg bolus + infusion).
 - Monitor and correct magnesium and potassium.
 - Infusion titrated based on hemodynamic response. Significant hyperglycemia persisted despite high-dose insulin, no hypoglycemia observed.



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Adjunctive & Second-Line Therapies

1. Methylene Blue

- Evidence limited in beta-blocker and calcium channel blocker ingestion (**case-report level**).
- Considered in refractory vasoplegia despite high-dose vasopressors.
- Contraindications: known G6PD deficiency, serotonergic medications.

2. ECMO Planning

- Patient stabilized sufficiently for transfer to center capable of VA-ECMO if she deteriorated.

3. Other Adjuncts Discussed

- Glucagon:
 - Classical antidote for BB overdose.
 - Less useful for CCB toxicity.
 - Can cause vomiting in non-intubated patients.
- Pacing:
 - Transcutaneous pacing may improve heart rate if capture achieved.
 - Unlikely to address vasoplegia, so not prioritized over pressors.
- Gastrointestinal Decontamination
 - Activated charcoal:
 - Not useful here due to >12 hours delay from ingestion.
 - Typically considered within 1–2 hours (up to 4 hours in select cases).
 - Whole bowel irrigation:
 - Limited evidence, not recommended with significant hemodynamic instability.
- Calcium Use
 - Intended to improve contractility, not primarily heart rate.
 - Supports intracellular calcium availability in myocardium.

Operational & Team Considerations

- Importance of:
 - Toxicology consultation but always applying advice within clinical context.
 - Multidisciplinary coordination (physicians, nursing, pharmacy, transport).
 - Collaboration with adult ICU colleagues if available given extensive experience with these toxic ingestions.
- Case highlighted the challenges of:
 - Drug preparation during rapid deterioration.
 - Teaching teams to shift from ACLS algorithms to toxicology-driven management.

Resources:



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- [Low dose push Epinephrine](#)
- [Poison Control](#)
- [Pediatric Infusion Guide](#)
- [Intubation](#)
- [Virtual Support Pathways](#)
- [Critical Care Outreach RN and RT](#)
- [Weight based drug sheets](#)
- [2023 American Heart Association Focused Update on the Management of Patients With Cardiac Arrest or Life-Threatening Toxicity Due to Poisoning Journal](#)

Here's how to download the free ZOOM App on your mobile device:

 **For Android (Chrome Browser):**

1. Open the **Google Play Store**
2. Search **"Zoom Cloud Meetings"**
3. Tap **Install**
4. Open the app
5. **Sign in** or **Join a Meeting**

 **For iPhone (Safari Browser):**

1. Open the **App Store**
2. Search **"Zoom Cloud Meetings"**
3. Tap **Get**
4. Open the app
5. **Sign in** or **Join a Meeting**

Tip: Allow camera and microphone access for full meeting participation.

Here's how to **bookmark the [Pediatric Critical Care Resources Website](#) as a shortcut on your smartphone home screen**, depending on your device and browser:

 **For iPhone (Safari Browser):**

1. **Open Safari** and go to the website you want to save.
2. Tap the **Share icon** (square with an arrow pointing up) at the bottom of the screen.
3. Scroll down and tap **"Add to Home Screen."**
4. You can edit the name if you like, then tap **Add**.
5. The shortcut will appear on your **Home Screen** like an app icon.

Only Safari supports this on iPhone (not Chrome or Firefox).

 **For Android (Chrome Browser):**



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1. Open **Google Chrome** and go to the website.
2. Tap the **three-dot menu** in the upper-right corner.
3. Tap **“Add to Home screen.”**
4. Edit the name if desired, then tap **Add**.
5. Confirm by tapping **Add automatically** or drag it to your preferred location.

Works with most Android devices using Chrome. Firefox has a similar option under its menu.

The resources shared throughout this session are for reference purposes only. Please consult your health authority leaders for guidance on adoption and use of these resources within your local context. The advice provided during the PCCL sessions is not intended to replace the clinical judgment of the healthcare providers who are with the patient. While PCCL sessions may suggest recommendations, the final decisions regarding a child's care and treatment should always rest with the healthcare professionals involved in their care at both the referring and receiving centres. If you need additional in the moment support refer to the Provincial Real Time Virtual Support Pathways: If you need additional in the moment support refer to the Provincial Pediatric Virtual Support Pathways: <https://childhealthbc.ca/pcc/provincial-pediatric-virtual-support-pathways>