

# J09: Calcium Channel Blocker Toxicity

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Updated: March 22, 2024

Reviewed: March 01, 2021

## Introduction

Calcium channel blockers, commonly used to treat hypertension and cardiac dysrhythmias, have a significant risk of toxicity if used inappropriately.

## Essentials

- As with most poisonings, out-of-hospital management options are limited. Protect the airway, ensure optimal oxygenation, support ventilation as necessary, and attempt to correct hypotension. Care more generally for the patient than for the specific suspected poison.
- Hypotension and bradycardia are common findings.
- Be aware of the possibility of co-ingestion of other medications or substances.
- Pre-existing heart disease and myocardial ischemia can cause symptoms similar to calcium channel blocker overdose and must be excluded.

## Additional Treatment Information

- As a first-line treatment, a fluid bolus of 500 mL should be given to any patient suspected of having overdosed on calcium channel blockers who is hypotensive, and may be repeated as necessary up to 1 L.
- Atropine should be considered in patients who are bradycardic, repeated as necessary, up to a total dose of 3 mg.
- Intravenous calcium (either calcium chloride or calcium gluconate) may overcome the cardiovascular effects of calcium channel blockers. Intravenous administration of 1-2 grams can be provided over 10 minutes.

## General Information

- Calcium channel blockers can be divided into two categories: the dihydropyridines, which block L-type calcium channels in the vasculature, and the non-dihydropyridines, which act on calcium channels in the myocardium.
  - The dihydropyridines include nifedipine, amlodipine, and felodipine. They are potent vasodilators and have limited effect on cardiac contractility or conduction. The non-dihydropyridines, diltiazem and verapamil, act more centrally and are more likely to directly affect cardiac output.
- In general, dihydropyridine drugs are more likely to cause arterial vasodilation and tachycardia, whereas diltiazem and verapamil tend to produce bradycardia and poor contractility.
- The changes in myocardial contractility may induce symptoms of heart failure. Carefully evaluate patients for signs of myocardial dysfunction, including shortness of breath and pulmonary edema.
- Patients who have overdosed on calcium channel blockers may have significant hyperglycemia. This is clinically insignificant, but may assist in diagnosis. Obtain and record a capillary blood glucose measurement.
- Epinephrine infusions may be required for patients whose hypotension and bradycardia are refractory to atropine and calcium. Profound calcium channel blocker toxicity may require significantly higher doses and dose rates than might otherwise be expected. Titrate drug doses to effect; be aware of arrhythmogenic potential.

## Interventions

### First Responder

- Keep the patient warm and protect from further heat loss
- Place the patient in a position of comfort, as permitted by clinical condition
- Protect the airway and ensure adequate oxygenation and ventilation
  - → [B01: Airway Management](#)

- Provide supplemental oxygen as required
  - → [A07: Oxygen Administration](#)

#### Emergency Medical Responder – All FR interventions, plus:

- Provide supplemental oxygen to maintain  $SpO_2 \geq 94\%$ 
  - → [A07: Oxygen Administration](#)
- Obtain capillary blood glucose measurement
- Initiate conveyance; consider intercept with additional resources

#### Primary Care Paramedic – All FR and EMR interventions, plus:

- Obtain vascular access and correct hypotension
  - → [D03: Vascular Access](#)

#### Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- For bradycardia:
  - [Atropine](#); repeated as necessary
  - → [C02: Bradycardia](#)
- [On/Call consultation required](#) prior to initiating any of the following therapies.
  - [Calcium chloride](#) 1-2 g IV over 10 minutes
  - Consider push-dose [EPINEPHrine](#) or infusion for hypotension refractory to calcium chloride
- Consider [glucagon](#) 5 mg slow IV push if available

#### Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Consider [Norepinephrine](#)
- Consider Glucagon IV 1-5 mg IVP (up to 15 mg)
- Consider lipid emulsion therapy 20% solution
  - [Call ETP prior to lipid emulsion therapy](#)
  - Bolus 1.5 ml/kg over 2 minutes
  - Infusion 1.5ml/kg over 60 minutes
- For bradycardia
  - [Call ETP prior to TVP therapy](#)
  - TVP
- Consider high dose insulin and glucose therapy

## Evidence Based Practice

### Overdose-Poisoning

#### Supportive

- [Activated Charcoal](#)
- [Naloxone-IM \(Opiate OD\)](#)
- [Naloxone-IN \(Opiate OD\)](#)
- [Naloxone-IV \(Opiate OD\)](#)
- [Naloxone-SQ \(Opiate OD\)](#)
- [Capnography](#)
- [Naloxone-Nebulized \(Opiate OD\)](#)

- [Oxygen](#)
- [Oxymetry Monitoring](#)
- [Sodium Bicarb \(TCA OD\)](#)

#### Neutral

- [Glucagon \(Beta-Blocker OD\)](#)
- [Treat & Release \(Opiate OD\)](#)

#### Against

- [Benzodiazepine antagonist \(Benzo OD\)](#)

## References

1. Barrueto F. Calcium channel blocker poisoning. In UpToDate. 2020. [\[Link\]](#)

