



Medical Direction and Practices Board
White Paper

Beta Blockers vs Calcium Channel Blockers for Rate Control

Background

Two classes of medications are commonly used for rate control in the patient with either atrial fibrillation or atrial flutter with a rapid ventricular response: beta blockers and calcium channel blockers. While there are several drugs available in each category, for emergency rate control, fast acting IV formulations are the most common. Historically, Maine EMS and the MDPB have only endorsed the use of beta blockers (metoprolol). Based on provider feedback, the MDPB revisited this decision and looked closely at the most common calcium channel blocker used for rapid ventricular response, diltiazem. After this review, the MDPB has chosen to stay with metoprolol as the drug of choice for rate control.

Is one drug better than the other?

The short answer:

- 1) Metoprolol and diltiazem have the same effectiveness in terms of time to rate control and amount of rate control when administered in as an IV bolus.
- 2) Calcium channel blockers should not be used in specific sub-groups of patients including those with decompensated heart failure. Beta blockers are considered much safer in this patient population.

The long answer:

Beta blockers and calcium channel blockers have been studied in several head-to-head trials in the emergency medicine literature^{1,2,3,4}. They have looked at outcomes such as time to adequate rate control and amount of heart rate reduction from each drug administration. Despite several trials, there are no clinically significant differences in these outcomes.

Calcium channel blockers have been shown to cause harm, and are *contraindicated*, in the subgroup of patients with decompensated heart failure⁵. This is a particularly difficult patient population to identify, especially in the prehospital setting, because it is often unclear whether the patient's symptoms are due to the heart rate alone or whether other factors are playing a role (i.e. acute myocardial ischemia, pulmonary edema, etc.).

Since calcium channel blockers may harm a subgroup of hard-to-identify patients and are not more effective than beta blockers, beta blockers remain the choice of the MDPB for rate control.

The largest argument heard by the MDPB and EMS professionals against metoprolol remains one of provider preference. This preference manifests itself as the preference of a single provider (i.e. emergency physician or cardiologist), a group of providers (i.e. the practice of hospital X's emergency department), or institutional preference. While clinical preferences are certainly understandable, there is not any compelling evidence at this time to change the protocol based on these preferences.

Can a calcium channel blocker be given after a beta blocker?

Yes. While each drug acts to reduce heart rate via conduction pathways at the A-V node, these two drugs can be used together. Patients are commonly on both classes of medications as part of their home regimen and emergent treatment of uncontrolled tachycardia may require maximizing one medication class and then adding a second class. As with all medication titrations, this should be done carefully and in a monitored setting. Patients who receive metoprolol in the prehospital setting can still receive calcium channel blockers in the hospital for further rate control if it is determined to be safe (i.e. the patient is determined not to be in decompensated heart failure).

Logistics of medications in the ambulance:

One more argument against adding calcium channel blockers to Maine EMS protocols is the logistics of storing the drug. Many forms of diltiazem are not shelf stable at room temperature for more than 30 days and would require refrigeration to prolong this rapid expiration, others are available but at a much higher cost. Metoprolol is shelf stable at room temperature for 2 years making it a much more suitable choice for ambulances.

Works cited:

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3. Scheuermeyer FX, Grafstein E, Stenstrom R, et al. Safety and efficiency of calcium channel blockers versus beta-blockers for rate control in patients with

- atrial fibrillation and no acute underlying medical illness. *Acad Emerg Med.* 2013;20(3):222-230.
4. Fromm C, et al. Diltiazem vs Metoprolol in the management of atrial fibrillation or flutter with rapid ventricular rate in the emergency department. *J Emerg Med.* 2015;49(2):175-182.
 5. 2014 AHA/ACC/HRS Guideline for the management of patients with atrial fibrillation. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society. *Circulation.* 2014;130:e199-e267.