THE OFFICE OF PREHOSPITAL CARE

To: MLREMS ALS Providers Advisory 07-01

From: Manish N. Shah, MD, MPH, FACEP
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Re: Unavailability of Diltiazem and Protocol Change

Recently, the manufacturer of diltiazem (Cardizem) announced that it will no longer produce the lypholized medication and will change to a multidose vial solution that requires refrigeration. It will not be practical for agencies to refrigerate the required amounts of diltiazem, and regional pharmacies will no longer be stocking diltiazem for prehospital use. Regional pharmacies are already phasing out the lypholized powder and stocks are likely to be depleted within a few weeks.

Effective immediately, metoprolol will be added to the MLREMS Protocol 3.6 – *Stable Narrow Complex Tachycardia,* for rate control of atrial fibrillation and atrial flutter. Diltiazem may be used if still available. Importantly, no patient should receive BOTH diltiazem and metoprolol for rate control.

Attached to this memorandum is the revised protocol which is effective immediately, as well as a brief information sheet on metoprolol for provider education. Please contact the Office of Prehospital Care with any questions.

A Brief Primer on Metoprolol for Rate Control of Atrial Fibrillation/Flutter

Atrial fibrillation and atrial flutter are common to prehospital providers. Both rhythms can be a result of many conditions, including:

- High blood pressure
- Coronary artery disease
- Heart valve disease
- Recent open heart surgery
- Chronic lung disease (COPD, emphysema)
- Heart failure
- Cardiomyopathy (disease of heart muscle that causes heart failure)
- Congenital (present at birth) heart disease
- Pulmonary embolism
- Hyperthyroidism (less common)
- Pericarditis (inflammation of the outside lining of the heart, rare)
- Viral infection (rare)

Many people live for years with atrial fibrillation without problems. However, because the atria are beating rapidly and irregularly, blood does not flow through them as quickly. This makes the blood more likely to clot. If the clot is pumped out of the heart, it can travel to the brain, resulting in a stroke. The likelihood of a stroke in people with atrial fibrillation or flutter without anticoagulation is one to six percent per year. Although about half of all blood clots related to atrial fibrillation result in stroke, clots can travel to other parts of the body (kidney, heart, intestines), causing other significant problems.

Atrial fibrillation can decrease the heart's pumping ability by as much as 20%-25% and when combined with a fast heart rate over a long period of time can result in heart failure. In the acute setting, atrial fibrillation with rapid ventricular response (Afib with RVR) can profoundly decrease the patients cardiac output resulting in symptoms ranging from mild palpitations and generalized weakness to florid acute CHF.

Recent studies have indicated that rate control of atrial fibrillation with medications such as calcium channel blockers or beta blockers is better than converting the patient to a sinus rhythm. As such, we see many patients on beta blockers or calcium channel blockers for their atrial fibrillation, along with coumadin (warfarin) to decrease the production of blood clots and minimize the risk of stroke.

In the prehospital environment, there is little need to treat atrial fibrillation unless the patient is exhibiting the following signs and symptoms:

> A narrow complex, irregularly irregular rhythm concerning for atrial fibrillation OR atrial flutter with a HR >150 AND evidence of CHF, mental status change, chest pain, hypotension, or shock symptoms (poor peripheral pulses, cool distal extremities, diaphoresis) suggests an unstable narrow complex tachycardia which, by protocol, should be managed by sedation (if possible) and cardioversion.
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> The presence of atrial fibrillation with RVR without signs of an unstable tachycardia can be managed with pharmacologic rate control. Previously diltiazem (Cardizem) was used to help slow AV node conduction and decrease the ventricular response. Unfortunately, diltiazem is no longer available, so another medication that slows conduction through the AV-Node will be used.

Metoprolol selectively antagonizes beta-1 receptors and is supplied in 5 mg vials. It has an onset within a few minutes and its duration is less than an hour when administered intravenously. Although it is used as a treatment adjunct for a number of other conditions (myocardial infarction, hypertension, etc) its only protocol indication is rate control of atrial fibrillation/flutter.

Because of its beta-blocking effects, there are the following contraindications to metoprolol's use:

1. Known hypersensitivity
2. Uncompensated congestive heart failure (signs/symptoms such as a change in mental status, hypotension, or shock suggest cardioversion is needed as the tachycardia is unstable and the use of a beta blocker in these circumstances will only hasten their decompensation)
3. Second or third degree heart block (for fear of extending it to complete heart block)
4. Cardiogenic shock (for the same reason as #2 above)
5. Blood pressure below 100 mmHg systolic (metoprolol can lower blood pressure, administering it to a patient with a BP less than 100 mmHg is likely to make them profoundly hypotensive).
6. Bradycardia (additional beta blockade can further slow the intrinsic or ventricular rate to the point of precipitating a symptomatic bradycardia).
7. Tachycardia with recent cocaine use (due to worsening tachycardia and hypertension in patients under the influence of cocaine)

Metoprolol does cause dose-dependant hypotension and should not be given rapid IV push. It should be given as 5 mg slow IV over 2-3 minutes. Patients with asthma or COPD may have worsening bronchospasm due to some beta-2 effects and it should be used with caution in this population.

Often it requires more than just a single dose of metoprolol to achieve rate control. Up to three doses may be given with the goal of a ventricular rate less than 120. Administration should be stopped if the patient experiences significant hypotension or bradycardia. If hypotension occurs, a fluid bolus should be followed by re-evaluation. If the patient exhibits symptomatic bradycardia, atropine may be given.

The reversal agent for metoprolol is glucagon which may be given intravenously but should only be given if the patient has continued symptomatic bradycardia or hypotension refractory to the above measures and with on-line medical direction.

Most importantly, metoprolol should not be given in conjunction with diltiazem for giving a patient both beta and calcium channel blocking agents has the potential for significant high-degree heart block, bradycardia, and hypotension.

CRITERIA:

1. Supraventricular is defined as non-sinus, narrow complex tachycardia with HR usually > 160.
2. If ECG complex >0.12, go to wide complex tachycardia protocol, especially if patient > 50 years of age, or has a history of previous MI, coronary artery disease, or CHF.
3. Stable Narrow Complex Tachycardia protocol - Asymptomatic or minor symptoms (palpitations, heart racing, etc.)
4. Unstable Narrow Complex Tachycardia protocol - HR >150 with CHF, mental status change, chest pain, hypotension, or shock symptoms (poor peripheral pulses, cool distal extremities, diaphoresis)

PROTOCOL:

ALL LEVELS:

1. Routine medical care.

EMT-CC, P:

2. Assess ECG rhythm, hemodynamic status, and stability of patient:

- If unstable, go to UNSTABLE TACHYCARDIA protocol
- If signs/history of Wolff-Parkinson-White Syndrome (WPW), go directly to Step 8
- If supraventricular tachycardia, go to Step 3
- If atrial flutter or atrial fibrillation, go to Step 6

3. Valsalva or other vagal maneuver. (No eyeball pressure/massage).

4. If inadequate response from vagal maneuver:

   Adenosine 6 mg rapid IV push

5. If inadequate response from 1st dose:

   Adenosine 12 mg rapid IV push, May repeat Adenosine up to a total of 30 mg.

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6. If atrial flutter / atrial fibrillation ***OR*** if inadequate response from Adenosine in narrow complex tachycardia with no signs of CHF or history of low ejection fraction:

   Diltiazem 0.25 mg/kg to maximum of 20 mg slow IV push

   OR

   Metoprolol 5 mg slow IV, may repeat every 5 minutes to maximum 15 mg or HR <120
   history of low ejection fraction, go to step 8.)

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7. If inadequate response from 1st dose of Diltiazem:

   Diltiazem 0.35 mg/kg to maximum of 20 mg slow IV push

8. If patient with signs/history of WPW or if patient unresponsive to previous interventions with signs of CHF or history of low ejection fraction:

   Amiodarone 150 mg slow IV over 10 minutes

NOTE: If patient becomes UNSTABLE (See criterion above), refer to UNSTABLE TACHYCARDIA protocol.

METOPROLOL

a) Pharmacology

(1) Antagonizes beta-1 adrenergic receptors

b) Pharmacokinetics

(1) Intravenously administered
(2) Effects within 3-5 minutes after administration
(3) Duration of action is 30-60 minutes.

c) Indications

(1) For rate control of atrial flutter or atrial fibrillation

d) Contraindications

(1) Known hypersensitivity
(2) Uncompensated congestive heart failure
(3) 2^{nd} or 3^{rd} degree heart block
(4) Cardiogenic shock
(5) Blood pressure below 100 mmHg systolic
(6) Heart rate less than 60

e) Adverse Effects

Hypotension, bradycardia, bronchospasm, nausea, vomiting, and dizziness

f) Precautions

May cause hypotension

g) Dosage

(1) Adult:
5 mg slow IV push every 5 minutes to maximum dose of 15 mg or HR <120
(2) Pediatric:
Not indicated