Table 2. Alternatives to IV Beta-Adrenergic Blockers in Specific Clinical Situations[14-16,18-22,24,26-28]

Situation	Alternatives and Dosing	Comments
Acute myocardial infarction, early treatment[14-16,18,20,21,24]	Atenolol:[a] 2.5 to 5 mg slow IV push. Repeat 2.5 to 5 mg every 2 to 10 minutes, up to a total dose of 10 mg over 10 to 15 minutes. If the IV doses are tolerated, then give atenolol 100 mg/day orally for 6 to 9 days in 1 to 2 divided doses. Esmolol:[b] Load with 500 mcg/kg IV over 1 minute, then infuse 50 mcg/kg/min for 4 minutes. If inadequate response after 5 minutes, continue IV infusion at 50 mcg/kg/min, or may increase rate by increments of 50 mcg/kg/min at intervals of ≥ 4 minutes, up to a maximum of 300 mcg/kg/min or until systolic blood pressure is less than 90 mm Hg. Start therapy with an oral beta-adrenergic blocker as soon as possible. Metoprolol:[c] 5 mg rapid IV push, then repeat dose every 2 to 5 minutes for a total of 3 doses (15 mg total dose). Within 15 minutes of the last IV dose, start metoprolol 25 to 50 mg orally every 6 hours for 48 hours, then increase to 100 mg orally twice daily thereafter.	Consider conserving IV beta-adrenergic blockers for those patients most likely to benefit from their use. The ACC / AHA guidelines recommend starting oral beta-adrenergic blockers within 24 hours of presentation. Dilute esmolol to a final concentration of ≤ 10 mg/mL before infusion (ie, 2.5 g/250 mL or 5 g/500 mL). Discontinue IV beta-adrenergic blockers for heart rate < 50 beats per minute or systolic blood pressure < 100 mm Hg. Begin oral therapy only in patients who tolerate IV beta-adrenergic blockers.
Unstable angina or non-ST-segment elevation myocardial infarction in patients at high risk for ischemic events[14-16,18,20,22,24]	Atenolol:[a] 5 mg slow IV push. May give an additional 5 mg dose after 5 minutes, for a maximum dose of 10 mg. Begin oral therapy 1 to 2 hours after the last IV dose. Esmolol:[b] Load with 500 mcg/kg IV over 1 minute, then start continuous infusion at 100 mcg/kg/min. Increase infusion rate by 50 mcg/kg/min every 10 to 15 minutes as needed to reach target heart rate, up to a maximum of 300 mcg/kg/min. Metoprolol:[c] 5 mg IV push over 1 to 2 minutes, then repeat dose every 5 minutes for a total of 3 doses (15 mg total dose). Within 15 minutes of the last IV dose, start metoprolol 25 to 50 mg orally every 6 hour for 48 hours, then increase to 100 mg orally twice daily thereafter. Propranolol: Give 0.5 to 1 mg IV initially. Within 1 to 2 hours of the IV loading dose, start propranolol 40 to 80 mg orally every 6 to 8 hours.	Consider conserving IV beta-adrenergic blockers for those patients most likely to benefit from their use. The ACC / AHA guidelines recommend starting oral beta-adrenergic blockers within 24 hours of presentation. Dilute esmolol to a final concentration of ≤ 10 mg/mL before infusion (ie, 2.5 g/250 mL or 5 g/500 mL). Target resting heart rate is 50 to 60 beats per minute. Discontinue IV beta-adrenergic blockers for heart rate < 50 beats per minute or systolic blood pressure < 100 mm Hg. Begin oral therapy only in patients who tolerate IV beta-adrenergic blockers.

Situation	Alternatives and Dosing	Comments
Hypertensive emergency[14-16,18-20,26-28]	Atenolol:[a] 1.25 to 5 mg slow IV push every 6 to 12 hours Enalaprilat: 1.25 to 5 mg slow IV push every 6 hours. In patients taking diuretics, give 0.625 mg initially; may increase to 1.25 mg for second dose if needed. Esmolol:[b] Load with 250 to 500 mcg/kg IV over 1 minute, then infuse 50 to 100 mcg/kg/min for 4 minutes. May repeat loading dose or increase infusion rate to a maximum of 300 mcg/kg/min. Hydralazine: 10 to 20 mg IV or 10 to 40 mg IM. May repeat every 4 to 6 hours as needed. Labetalol:[d] 20 to 80 mg slow IV push, then 40 to 80 mg IV every 10 minutes as needed to reduce blood pressure, up to a maximum dose of 300 mg. May also give 0.5 to 2 mg/min by continuous IV infusion, up to a maximum dose of 300 mg. Metoprolol:[c] 1.25 to 5 mg IV every 6 to 12 hours.	In stable patients, the goal is to reduce blood pressure 25% within 1 hour, then further reduce to 160/100 to 160/110 mm Hg in the next 2 to 6 hours. The hypotensive effects of IM hydralazine are delayed compared with IV administration.
Hypertension, short-term management in patients unable to take oral medications[14,16,18-20,28,29]	Atenolol:[a] 1.25 to 5 mg slow IV push every 6 to 12 hours. Enalaprilat: 0.625 to 1.25 mg slow IV push every 6 hours. Esmolol:[b] Infuse 500 mcg/kg/min IV for 30 to 60 seconds, then infuse 25 to 50 mcg/kg/min for 4 minutes. If inadequate response after 5 minutes, may give additional loading doses (500 mcg/kg IV over 1 minute) then increase infusion by 50 mcg/kg/min at 5-minute intervals (1 minute for loading dose, then 4 minutes at next higher rate) up to a maximum of 300 mcg/kg/min. Hydralazine: 10 to 20 mg IV. May repeat every 4 to 6 hours as needed. May increase to 40 mg/dose if needed. Labetalol:[d] 10 to 20 mg slow IV push, then 40 to 80 mg IV every 10 minutes as needed to reduce blood pressure, up to a total dose of 300 mg/day. Metoprolol:[c] 1.25 to 5 mg IV every 6 to 12 hours initially. Titrate to response. Some patients may need up to 15 mg every 3 to 6 hours.	Consider reserving IV beta-adrenergic blockers for those patients with UA and NSTEMI most likely to benefit from their use. Dilute esmolol to a final concentration of ≤ 10 mg/mL before infusion (i.e., 2.5 g/250 mL or 5 g/500 mL).
Supraventricular tachyarrhythmias[16,18,22]	Esmolol:[b] Load with 500 mcg/kg IV over 1 minute, then infuse 50 mcg/kg/min for 4 minutes. If inadequate response after 5 minutes, continue IV infusion at 50 mcg/kg/min, or increase rate by 50 mcg/kg/min. May give a second load of 500 mcg/kg IV over 1 minute, then continue infusion at 100 mcg/kg/min for 4 minutes. May give a third loading dose of 500 mcg/kg IV over 1 minute if necessary, then continue infusion at 150 to 200 mcg/kg/min. Do not give additional loading doses if nearing target ventricular rate or if patient is hypotensive. Wait at least 4 minutes between rate increases. Continue infusion and titrate to maximum of 300 mcg/kg/min. Propranolol: 1 mg slow IV push (maximum rate 1 mg/min). May repeat every 5 minutes up to a total of 5 mg. Alternatively, may give 1 to 3 mg IV once, then repeat dose after 2 minutes. Titrate to desired response.	The use of IV beta-adrenergic blockers for supraventricular tachyarrhythmias is usually limited to atrial flutter/fibrillation or sinus tachycardia. They may also be used in patients with supraventricular tachycardia that is uncontrolled by adenosine and vagal maneuvers. Dilute esmolol to a final concentration of ≤ 10 mg/mL before infusion (ie 2.5 g/250 mL or 5 g/500 mL).

[a]Atenolol injection has been discontinued.[1,2]
[b]Some presentations of esmolol injection were in short supply.[3,5, 6,11]
[c]Some presentations of metoprolol injection were currently in short supply.[6, 8-10]
[d]Some presentations of labetolol injection were in short supply.[5-7,9,12]

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