

Which patients undergoing noncardiac surgery benefit from perioperative beta-blockers?

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Evidence-based answer

Patients with moderate to high cardiac risk (a Revised Cardiac Risk Index [RCRI] score of 2 or higher [TABLE]) have a reduced risk of in-hospital death following perioperative beta-blocker therapy (strength of recommendation [SOR]: **B**, based on a large retrospective cohort study). There is, however, no proven benefit to perioperative beta-blocker therapy without prior cardiac risk stratification (SOR: **A**, based on systematic reviews).

Perioperative beta-blockers reduce cardiovascular risk even more when a long-acting beta-blocker (atenolol) is chosen

over a shorter-acting one (metoprolol) (SOR: **B**, based on a retrospective cohort study), and when this therapy is titrated to a target heart rate of <65 bpm (SOR: **B**, based on cohort studies).

Perioperative beta-blocker therapy is most effective when initiated at least 30 days before surgery and continued throughout the hospital stay (SOR: **C**, expert opinion extrapolated from systematic review). Patients already on beta-blockers before surgery should continue at least through the perioperative period (SOR: **C**, expert opinion).

Clinical commentary

Who better than you to reduce your patient's risk?

Family physicians are in an excellent position to assess and reduce their patients' risks of complications from elective surgery.

While perioperative beta-blockers do not benefit every surgical patient, they do benefit certain high-risk patients. In

fact, these same high-risk patients are often candidates for chronic beta-blocker therapy, according to current ACC/AHA guidelines. Thus, an upcoming surgery gives us another opportunity to identify these patients and get them treated.

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Evidence summary Studies without risk stratification find little benefit from beta-blockers

A systematic review including 25 randomized controlled trials (RCTs) evaluated perioperative beta-blocker therapy for noncardiac surgery in a total of 2722

patients who were not stratified according to cardiac risk status.¹

Perioperative beta-blockers produced no significant effect on:

- all-cause mortality (odds ratio [OR]=0.78; 95% confidence interval [CI], 0.33–1.87),

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Perioperative beta-blockers did not reduce all-cause mortality or acute MI in studies without risk stratification

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Perioperative beta-blockers reduced the risk of in-hospital death in patients with moderate to high cardiac risk—an RCRI of 2 or more

TABLE

Before surgery, calculate your patient's cardiac risk

Assign 1 point for each of the following, and total:

- High-risk surgery (intraabdominal, intrathoracic, or suprainguinal vascular procedures)
- History of ischemic heart disease
- History of heart failure
- History of cerebrovascular disease
- Diabetes mellitus treated with insulin
- Serum creatinine >2.0 mg/dL

POINTS	CLASS	RISK OF MAJOR CARDIAC EVENT*
0	I	0.4%
1	II	0.9%
2	III	6.6%
3+	IV	11%

*Major cardiac event includes myocardial infarction, pulmonary edema, ventricular fibrillation, primary cardiac arrest, and complete heart block.

Source: Lee et al, 1999.⁴

- acute myocardial infarction (OR=0.59; 95% CI, 0.25–1.39),
- atrial fibrillation/flutter and other supraventricular arrhythmias (OR=0.43; 95% CI, 0.14–1.37), or
- length of hospital stay (weighted mean difference, –5.6 days; 95% CI, –12.2, 1.04).

However, in this review perioperative beta-blocker therapy reduced perioperative myocardial ischemia (OR=0.38; 95% CI, 0.21–0.69), and increased 2 adverse outcomes: hemodynamically significant bradycardia (OR=1.98; 95% CI, 1.08–3.66) and hypotension requiring treatment (OR=2.52; 95% CI, 1.94–3.28).¹ This study was limited by the inconsistent definition and assessment of outcomes among the individual trials.

No effect on total mortality, but a benefit in a composite outcome. An earlier systematic review with 22 RCTs and 2437 total patients, that was also not stratified according to cardiac risk status, found no effect from perioperative beta-blockers on

total mortality or cardiovascular mortality alone. However, it did demonstrate a composite outcome of reduced cardiovascular mortality, reduced nonfatal myocardial infarction, and reduced nonfatal cardiac arrest (relative risk [RR]=0.44; 95% CI, 0.20–0.97) 30 days after surgery.²

Beta-blockers benefit certain high-risk patients

A retrospective cohort study evaluated the effect of perioperative beta-blocker therapy on perioperative mortality, according to preoperative RCRI assessment.³ The study population included 663,635 adults (mean age, 62 years) undergoing major noncardiac surgery at 329 US hospitals. Researchers calculated individual RCRI scores (TABLE).⁴ Half the patients had an RCRI of 0, 38% had an RCRI of 1, 10% had an RCRI of 2, and only 2% had an RCRI of 3 or greater.

Be wary of beta-blockers in low-risk patients. In the 580,665 patients with low cardiac risk, perioperative beta-blocker therapy increased the risk of in-hospital death: for all patients with an RCRI of 0: OR=1.36 (95% CI, 1.27–1.45); number needed to harm (NNH)=208; for all patients with an RCRI of 1: OR=1.09 (95% CI, 1.01–1.19); NNH=504.

A different story for high-risk cardiac patients. Perioperative beta-blocker therapy reduced the risk of in-hospital death in patients with an RCRI of 2 (OR=0.88; 95% CI, 0.80–0.98; number needed to treat [NNT]=227), an RCRI of 3 (OR=0.71; 95% CI, 0.63–0.80; NNT=62), or an RCRI of 4 or more (OR=0.58; 95% CI, 0.50–0.67; NNT=33).

Long-acting beta-blockers = fewer MIs

A population-based, retrospective cohort analysis with 37,151 patients over 65 years of age compared perioperative beta-blocker therapy using atenolol (a long-acting beta-blocker) with metoprolol (a shorter-acting beta-blocker) for elective surgery.⁵ Investigators excluded patients with symptomatic coronary disease.

Patients taking atenolol had fewer MIs (1.6% vs 2.0%, $P=.004$) and fewer deaths (1.2% vs 1.6%, $P=.007$) when compared with metoprolol. Atenolol produced a 13% relative risk reduction over metoprolol for MI or death after adjusting for age, sex, type of surgery, and use of furosemide, calcium-channel blockers, angiotensin-converting enzyme inhibitors, and statins (comparative NNT=165).

Dose titration by heart rate

An observational cohort study with 272 patients undergoing elective major vascular surgery (mean age 67.4 years, 80% male) evaluated whether higher doses of beta-blockers and tight heart rate control reduced perioperative myocardial ischemia and troponin T release.⁶ Patients with higher beta-blocker doses, lower heart rates, and lower absolute change in heart rate during the perioperative period had significantly less perioperative myocardial ischemia and troponin T release ($P<.0001$).

The DECREASE-II trial, a prospective cohort study with 1476 patients undergoing elective open abdominal aortic or infrainguinal arterial reconstruction also found that patients with heart rates <65 beats per minute had a significantly lower risk of cardiac death or MI at 30 days postoperatively (1.3% vs 5.2%, OR=0.24; 95% CI, 0.09–0.66).⁷

Begin therapy 30 days before surgery

Authors of a systematic review including 5 RCTs (586 total patients) evaluating perioperative beta-blocker therapy in noncardiac surgery concluded that beta-blocker therapy should begin as long as 30 days prior to surgery to allow for titration of dose to the target heart rate and continue at least throughout hospitalization (longer if adequate medical follow-up can be arranged postoperatively).⁸

Recommendations from others

The American College of Cardiology/American Heart Association Task Force

on Practice Guidelines⁹ recommends:

- continuing beta-blockers for patients already receiving them to treat angina, symptomatic arrhythmias, and hypertension before their surgical risk evaluation.
- initiating perioperative beta-blocker therapy for patients undergoing vascular surgery if they are at high cardiac risk, as evidenced by ischemia on preoperative testing.
- considering perioperative beta-blocker therapy for patients undergoing intermediate- to high-risk procedures if preoperative risk assessment identifies them as having intermediate or higher cardiac risk, and for patients undergoing vascular surgery who are at low cardiac risk. ■

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Higher beta-blocker doses and lower heart rates during the perioperative period led to less perioperative myocardial ischemia