

Peri-Operative Management of Hypertension: An Internist's Perspective

Disclosure Statement

The speaker's research and educational activities have been supported in the past (but NOT in the last 12 months) by essentially every pharmaceutical company that makes, markets or distributes antihypertensive drugs in the USA. The information presented is therefore likely to be biased. Healthcare providers are therefore strongly cautioned NOT to use the information presented in their daily practices (see, for example, *The People of the United States of America v Peter Gleason*) until and unless the specific agent or therapy receives formal approval from the US FDA for exactly the indication under consideration by the healthcare provider.

Affidavit of Originality

The following material is based exclusively on the speaker's own opinion, knowledge and expertise. There is no organization, company, or entity that has exercised any control or influence over the content of this presentation, nor has any other person or organization had any part in drafting, scripting or designing its content. The information presented is based on the principles of "Evidence-Based Medicine," and is intended to avoid promotion of any specific commercial interest, product, or company.

Disclaimers

The speaker has participated (with known experts in the field) in writing a "Scientific Statement" from the American Heart Association on the topic of "Treatment of Hypertension in Patients with Coronary Heart Disease." This presentation does **not** reflect opinion, consensus, or recommendations from the American Heart Association.

The speaker currently serves as the Chair of the Continuing Education Committee and as a member of the Education Committee of the American Society of Hypertension, which is involved in reconciling US hypertension guidelines. This process is embargoed, and will **not** be discussed.

Educational Objectives

At the end of this 35-minute presentation, the **awake** audience member should be able to:

- 1) Provide a plan (and appropriate justification for it), for a 68-year old man in your practice whose elective surgery was cancelled at 06:30 on the morning of his scheduled procedure, because of a blood pressure in the pre-anesthesia preparation room of 186/108 mm Hg.
- 2) Recommend which antihypertensive medications should be held, and which should be taken, on the morning of an elective surgical procedure.
- 3) Explain why the peri-operative management of hypertensive patients is now inexorably linked with concerns about ethics and scientific integrity.

Evidence-Based References

1. Martie A, McCormack T, Carlisle J, et al. The measurement of adult blood pressure and management of hypertension before elective surgery: Joint guidelines from the Association of Anaesthetists of Great Britain and Ireland and the British Hypertension Society. *Anaesthesia*. 2016;**71**:326-37. Available on the internet at: www.ncbi.nlm.nih.gov/pmc/articles/PMC5066735/, accessed 09 AUG 17.
2. Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA Guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: Executive summary. *J Am Coll Cardiol*. 2014;**64**:e77-e137; simultaneously published in *Circulation*. 2014;**130**:2215-45. Available on the internet at: www.circ.ahajournals.org/content/130/24/2215, accessed 09 AUG 17.
3. Wijeyesundera DN, Duncan D, Nkonde-Price C, et al. Perioperative beta blockade in noncardiac surgery: A systematic review for the 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: A report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. *J Am Coll Cardiol*. 2014;**64**:2406-25; simultaneously published in *Circulation*. 2014;**130**:2246-64. Available on the internet at: www.circ.ahajournals.org/content/130/24/2246.long, accessed 09 AUG 17.

Abstract

Preoperative blood pressure elevations are common, and are often due to anxiety, pain, the “white-coat” effect, and/or medication withdrawal. Elevated blood pressure ranked as either the #1 or #2 reason for postponed surgery in three large series. Intubation and induction of anesthesia often raise blood pressure and heart rate, moreso in chronically hypertensive patients. **Hypotension** is a much bigger problem for anesthesiologists, and is exacerbated by anesthetic agents (especially IV drugs), reduced sympathetic tone (after induction), blood loss, upright position, and intraoperative events. Blood pressure variability ($\pm 20\%$ from baseline) during surgery is more extreme in chronically hypertensive patients, and often portends a worse prognosis. Data from the early 1950s suggested that hypertension increases cardiovascular risk during noncardiac surgery, but more recent and much larger datasets suggest that chronic hypertension is but a “minor” risk factor for adverse outcomes, and pre-operative hypertension increases cardiovascular complications by only 35% (versus 2- to 11-fold for other conditions). Hypertension after surgery increases the risk of an unplanned ICU admission and in-hospital mortality rates. Current US national guidelines recommend the Revised Cardiac Risk Index (www.mdcalc.com/revised-cardiac-risk-index-for-pre-operative-risk) to help evaluate patients before noncardiac surgery. Hypertension is **NOT** one of the included risk factors, which suggests that the common practice of canceling surgery if the blood pressure is $\geq 180/110$ mm Hg is no longer warranted. There are many missing pieces of the evidence base for pre- and peri-operative management of blood pressure, which are better known to anesthesiologists than internists.

Current US guidelines recommend NOT using older medications for pre- and peri-operative treatment of hypertension, because of their unpredictable effects on blood pressure. Pre- and peri-operative clonidine was tested against placebo in POISE-2, and was ineffective in improving outcomes; it caused significantly more hypotension and bradycardia. Anesthesiologists often recommend that ACE-inhibitors and ARBs be held on the morning of surgery, because of case series and one uncontrolled cohort study showing more resistant hypotension if these drugs were taken the morning of surgery. Pre- and peri-operative beta-blockers are far more controversial, despite a

significant 31% reduction in 30-day MI rate, because the methods and conclusions of the three largest and most often cited trials have been challenged. The DECREASE family of studies was formally investigated for possible scientific misconduct of the Primary Principal Investigator, who resigned from The Erasmus University. The POISE(-1) trial studied 100 mg of metoprolol succinate, given 2-4 hours before surgery, and did observe a significant 27% reduction in 30-day MI rate. However, this was accompanied by a 33% increase in death, 117% increase in stroke, 55% increase in hypotension and 174% increase in bradycardia. Thus recently updated US guidelines now recommend NOT routinely giving a beta-blocker before surgery unless there is another good reason to do so. Current US guidelines make no specific recommendations for antihypertensive drug therapy in the pre- and peri-operative period (consistent with FDA labeling), but many anesthesiologists favor clevidipine (because of its outcomes in ECLIPSE). The current US algorithm for management of hypertension in the peri-operative period is complex. A simpler algorithm recommends postponement of surgery if the patient has an active high-risk CV disease, calculation of the Revised Cardiac Risk Index, evaluating functional status if RCRI ≥ 2 , and recommending a stress test (and more invasive procedures thereafter) if the patient has symptoms at < 4 mets. If the patient is asymptomatic, and the blood pressure is $\geq 180/110$ mm Hg, most anesthesiologists will cancel the case (despite no clinical evidence that this is beneficial). Lower blood pressures are usually managed intra- and post-operatively with IV agents until the patient leaves the post-anesthesia recovery unit. Care of the patient's blood pressure thereafter often reverts to the internist.

Suggested Reading (in addition to the three cited above)

Weksler N, Klein M, Dzendo G, et al. The dilemma of immediate preoperative hypertension: To treat and operate, or to postpone surgery? *J Clin Anesth.* 2003;**15**:179-83.

Dix P, Howell S. Survey of cancellation rate of hypertensive patients undergoing anaesthesia and elective surgery. *Br J Anaesth.* 2001;**86**:789-93.

Smithwick RH, Thompson JE. Splanchnicectomy for essential hypertension: Results in 1,266 cases. *J Am Med Assoc.* 1953;**152**:1501-4.

Goldman L, Caldera DL, Nussbaum SR, et al. Multifactorial index of cardiac risk in noncardiac surgical procedures. *N Engl J Med.* 1977;**297**:845-50.

Khuri SF, Daley J, Henderson W, et al. The Department of Veterans Affairs' NSQIP: The first national, validated, outcome-based, risk-adjusted, and peer-controlled program for measurement and enhancement of the quality of surgical care. National VA Surgical Quality Improvement Program. *Ann Surg.* 1999;**228**:491-507.

Rose DK, Cohen MM, DeBoer DP. Cardiovascular events in the postanesthesia care unit: Contribution of risk factors. *Anesthesiology.* 1996;**84**:772-81.

Howell SJ, Sear JW, Foëx P. Hypertension, hypertensive heart disease, and perioperative cardiac risk. *Br J Anaesth.* 2004;**92**:570-83.

Fleisher LA, Beckman JA, Brown KA, et al. ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery: A report of the American College of

Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). *Circulation*. 2007;**116**:e418-e500.

Devereaux PJ, Sessler DI, Leslie K, et al. Clonidine in patients undergoing noncardiac surgery. *N Engl J Med*. 2014;**370**:1504-13.

Coriat P, Richer C, Douraki T, et al. Influence of chronic angiotensin-converting enzyme inhibition on anaesthetic induction. *Anesthesiology*. 1994;**81**:299-307.

Brabant SM, Bertrand M, Eyraud D, Darmon PL, Coriat P. The hemodynamic effects of anesthetic induction in vascular surgical patients chronically treated with angiotensin II receptor antagonists. *Anesth Analg*. 1999;**89**:1388-92.

Comfere T, Sprung J, Kumar MM, et al. Angiotensin system inhibitors in a general surgical population. *Anesth Analg*. 2005;**100**:636-44.

Wijeysundera DN, Duncan D, Nkonde-Price C, et al. Perioperative beta blockade in noncardiac surgery: A systematic review for the 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2014;**130**:2246-64; simultaneously published in *J Am Coll Cardiol*. 2014;**64**:2406-25.

Expression of concern relating to Polderman D, Boersma E, Bax JJ, et al., for the Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography Study Group: “Bisoprolol reduces cardiac death and myocardial infarction in high-risk patients as long as 2 years after successful major vascular surgery.” *Eur Heart J*. 2015;**36**:663.

Chopra V, Eagle KA. Perioperative mischief: The price of academic misconduct. *Am J Med*. 2012;**125**:953-5.

Poldermans D. Scientific fraud or a rush to judgment? *Am J Med*. 2013;**126**:e5-6.

Devereaux PJ, Yang H, Yusuf S, et al, for the POISE Study Group. Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery (POISE trial): A randomised controlled trial. *Lancet*. 2008;**371**:1839-47.

Aronson S, Dyke CM, Stierer KA, et al. The ECLIPSE trials: Comparative studies of clevidipine to nitroglycerin, sodium nitroprusside, and nicardipine for acute hypertension treatment in cardiac surgery patients. *Anesth Analg*. 2008;**107**:1110-21.

Bove T, Zangrillo A, Guarracino F, et al. Effect of fenoldopam on use of renal replacement therapy among patients with acute kidney injury after cardiac surgery: A randomized clinical trial. *JAMA*. 2014;**312**:2244-53.

Faculty Question & Answers

1. A hypertensive man had a BP of 186/108 mm Hg, so his operation was cancelled. The patient's internist should write for:
 - a. Cardiac cath consult.
 - b. Review antihypertensive medications; consider "white-coat hypertension."**
 - c. Protest letter to the surgeon.
 - d. Testosterone level from the anesthesiologist.

2. Which of the following is most appropriate to recommend that the patient **hold** on the morning before an elective non-cardiac surgical procedure?
 - a. Atenolol.
 - b. Clonidine.
 - c. Furosemide.
 - d. Lisinopril.**

3. Routinely giving a beta-blocker before low-risk noncardiac surgery is controversial because:
 - a. It complicates induction of anesthesia in asthmatics.
 - b. It leads to drug-drug interactions.
 - c. It is not cost-effective.
 - d. The validity of some large published clinical trials has been impugned.**