

## Original Contributions

# Canceling dental procedures due to elevated blood pressure

## Is it appropriate?

Steven A. Yarows, MD; Olga Vornovitsky, MD; Robert M. Eber, DDS, MS;  
John D. Bisognano, MD, PhD; Jan Basile, MD

### ABSTRACT

**Background.** In 1974, the American Dental Association first considered recommending that dental offices measure blood pressure (BP) routinely, and it has been further encouraged since 2006. Investigators in several dental publications have recommended cancellation of dental procedures based solely on BP greater than 180/110 millimeters of mercury for urgent oral health care and greater than 160/100 mm Hg for elective oral health care, in the absence of prior medical consultation.

**Methods.** The authors reviewed the evidence for cancellation of any dental or surgical procedures by using an Ovid MEDLINE search for the terms *dental*, *elevated blood pressure*, and *hypertension*. In addition, the authors searched resources at [ebd.ada.org](http://ebd.ada.org) using the same criteria. The authors collaborated to develop recommendations in view of 2017 guidelines on this subject.

**Results.** To the authors' knowledge, there are no professionally accepted criteria or study evidence indicating a specific BP elevation at which to prohibit oral health care. Researchers of a 2015 review on management of comorbidities in ambulatory anesthesia failed to find increased morbidity from hypertension in the outpatient setting.

**Conclusions.** To the authors' knowledge, there are no prospective study investigators that have addressed whether or when to cancel dental procedures due to office-measured elevated BP. The authors recommend using current anesthesiology guidelines based on functional status and past BP measurements to prevent unnecessary cancellations.

**Practical Implications.** It is seldom necessary to cancel dental procedures on the basis of BP measured before a planned procedure for patients under a physician's care.

**Key Words.** Dental procedures; blood pressure measurement; adverse outcomes.

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**H**ypertension (HTN) is usually an asymptomatic disease. Elevated blood pressure (BP) readings obtained during BP screenings, office visits, or home measurements lead to an initial diagnosis of suspected HTN. The prevalence of HTN increased from 29% in 1988 through 1991, according to the Third National Health and Nutrition Evaluation Survey, to 31.9% in 2003 as reported in *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* guidelines.<sup>1,2</sup> With publication of the 2017 American College of Cardiology-American Heart Association guidelines, which set the new definition of HTN at the lower BP of greater than or equal to 130/80 millimeters of mercury, more screening for HTN is likely, as the prevalence of HTN in the US adult population is anticipated to increase to 45.6%.<sup>3</sup>

It is standard practice in medicine to measure BP before inpatient and outpatient procedures. The American Dental Association first considered recommending that dental offices routinely measure BP in 1974, but this was not widely adopted.<sup>4</sup> Since 2006, after the publication of *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure*, dentists have also been encouraged to measure BP to improve detection of undiagnosed HTN.<sup>5</sup> BP measurement has been found to increase detection of HTN in dental

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patients.<sup>6,7</sup> When performed correctly, measurement of BP outside of a primary care physician's office is important in improving detection of undiagnosed HTN in the community.

We recognize that interprofessional care of patients with substantial health problems often requires consultation between the dentist and primary care physician for the safe treatment of patients. Unfortunately, our clinical experience as physicians has been that BP readings taken in dental offices often do not follow standard protocol, are not always accurate, and falsely elevated BP readings can occur.<sup>8</sup> Virtually all clinical trials measure BP in the seated position with the back supported and feet on the floor, which is the preferred position specified in an article on proper measurement.<sup>9</sup> The lead author (S.A.Y.) has observed that many patients who have been sent for medical consultation owing to elevated BP have had BP measurements taken outside of a physician's office with uncalibrated devices, devices inherently inaccurate (that is, preoperative forearm or wrist measurements or wrist BP measurement devices), improper cuff size selection, or improper positioning of the patient, such as semisupine measurements in a dental chair.

Most reports of harm from procedures during uncontrolled HTN are from major inpatient procedures. This is based mainly on observational studies before 2006, when HTN control rates were poor.<sup>10</sup> However, to our knowledge, there is no literature or evidence reporting increased medical procedure risk with elevated BP in an outpatient setting. Because there are no randomized trials evaluating outcomes in patients with elevated preprocedure HTN, experts have recommended an optimal preoperative BP of less than 130/80 mm Hg for medical procedures in older patients and surgery cancellation if BP is greater than 180/110 mm Hg.<sup>9</sup>

Researchers have reported anecdotal cases of adverse events with uncontrolled HTN during dental procedures (for example, trigeminal manipulation and epinephrine anesthetic); however, causation has not been determined.<sup>11,12</sup> Lidocaine 2% with epinephrine (1:100,000) administered by means of injection had no substantial effect on systolic or diastolic BP when limited to 3 cartridges in patients with stage 1 or stage 2 HTN in a randomized study of 88 patients, nor did articaine 4% with epinephrine (1:200,000) in a randomized study of 50 patients.<sup>13,14</sup>

In 1998, the first dental guideline to address this issue stated that “no elective oral health care should be provided for patients with hypertensive symptoms,” and that general anesthesia in a patient with “BP of 180/110 mm Hg or greater may be associated with a greater risk of experiencing an ischemic event.”<sup>15</sup> There is, however, no professionally recognized criteria or study evidence that indicates a specific BP elevation at which oral health care is prohibited.<sup>16</sup> It is recognized that there is often anxiety and pain in patients seeking oral health care, which can contribute to BP elevation. In 2004, BP greater than 180/110 mm Hg was suggested as a cutoff point for not providing oral health care on the basis of *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* guidelines, although the guidelines did not explicitly state this.<sup>2</sup> This was suggested as “sound advice” pending clear guidelines from research or professional consensus. Investigators in several dental publications have reported that uncontrolled HTN poses a minor risk for surgery, but because most dental procedures are elective, they recommended cancellation of most dental procedures if BP is greater than 180/110 mm Hg and referral of the patient to their primary care provider for evaluation and management.<sup>17</sup> Contrary to this, an American Dental Association book recommended cancellation of elective oral health care if BP is greater than 160/100 mm Hg in the absence of medical consultation.<sup>18</sup>

Because dentists' measuring BP is encouraged, how often are patients with elevated BP readings sent for consultation before the dental procedure is performed? Results of a retrospective review of dental school records from 1999 through 2000 found that nearly one-third of the sample had high BP and that “nearly 9 percent of the hypertensive patients with elevated blood pressure had to be immediately sent for medical consult before they could receive dental treatment.”<sup>19</sup> Because this was a retrospective chart review, the criteria for canceling the procedure and sending the patient for an immediate medical consultation could not be determined.

## ABBREVIATION KEY

**BP:** Blood pressure.  
**HTN:** Hypertension.

## PREOPERATIVE RISK ASSESSMENT FOR INPATIENT PROCEDURES

The first multifactorial risk calculator for noncardiac inpatient surgical procedures excluded patients scheduled for minor procedures and did not use elevated BP for the risk calculation.<sup>20</sup> The latest

## Box 1. Questions to determine functional capacity of at least 4 metabolic equivalents.\*

### ACTIVITY of AT LEAST 4 METABOLIC EQUIVALENTS

- Can you do light work around the house like dusting or washing dishes?
- Can you climb a flight of stairs or walk up a hill?
- Can you walk on level ground at 4 miles per hour (6.4 kilometers per hour)?
- Can you run a short distance?
- Can you do heavy work around the house, like scrubbing floors or lifting or moving heavy furniture?
- Can you participate in golf, bowling, dancing, doubles tennis, or throwing a baseball or football?

\* Adapted with permission of the publisher from Fleisher and colleagues.<sup>22</sup>

HTN guidelines use both BP values and risk stratification for treatment goals, which could potentially be used for other risk assessment.<sup>21</sup>

The 2009 update on perioperative assessment for noncardiac surgery focused on active cardiac conditions (for example, unstable coronary syndromes, decompensated congestive heart failure, substantial arrhythmias, and severe valvular conditions) along with functional capacity.<sup>22</sup> If no active cardiac conditions were present and the patient's functional capacity was at least 4 metabolic equivalents (a standard measure of energy expenditure) (Box 1), patients were considered to be at low risk for simple procedures. In addition, in patients with BP less than 180/110 mm Hg, there would be no indication to cancel surgery based solely on BP. In patients with BP greater than 180/110 mm Hg, the 2009 update stated that the potential benefits versus risks of delaying surgery should be weighed against each other.<sup>22</sup>

If a dental patient with newly identified elevated BP is referred to a physician to have their BP managed before dental treatment, what should the goals of this referral be? Based on expert opinion, there is no known benefit of perioperative initiation of new antihypertensive therapy, especially in older patients with predominantly isolated systolic HTN.<sup>23</sup> Regarding the risk of developing hypotension associated with BP-lowering medications, evidence suggests that holding angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers 24 hours before noncardiac surgery may decrease intraoperative hypotension, but all-cause mortality or major cardiovascular events remain the same regardless whether renin-angiotensin system—blocking therapy was held or continued. Failure to restart these agents within 48 hours of the operation, however, resulted in postoperative HTN and increased 30-day mortality.

More recent 2016 inpatient elective surgical guidelines suggest that if the mean BP, as documented in outpatient primary care records in the preceding 12 months, is less than 160 mm Hg systolic and 100 mm Hg diastolic, preoperative clinics do not need to measure BP in patients being prepared for elective surgery.<sup>24</sup> This would eliminate cancellation due to presurgical elevated BP but may not be a practical guideline for dentistry because most dentists do not have access to their patients' electronic medical records.

### AVOIDING OUTPATIENT PROCEDURE CANCELLATION DUE TO ELEVATED BLOOD PRESSURE

We could not find any literature regarding the incidence of cancellation of elective dental procedures due to HTN; however, in the lead author's (S.A.Y.) primary care practice, this occurs approximately 4 times per year, based solely on elevated BP readings. Cancellation of procedures has financial and nonfinancial (psychological, social) losses and is a problem worldwide for inpatient and outpatient procedures. The impact on patients associated with this practice should be considered in light of the paucity of evidence supporting elective dental procedure cancellation due to an elevated BP reading.

## Box 2. Risk stratification for patients whose correctly measured blood pressure is greater than 180/110 millimeters of mercury.\*

### RISK STRATIFICATION CATEGORY

#### Category A

- Is the patient taking antihypertensive medication, and did he or she take it this day?
- Does the patient have a health care provider managing his or her hypertension and has he or she been seen in the past 6 months?
- Does the patient appear anxious, acknowledge anxiety about the procedure, or have a heart rate > 100 beats per minute?

#### Category B

- Did the patient take public transportation or drive and walk in for the procedure?
- Does the patient take care of his or her own house or apartment?
- Does the patient state he or she can walk up a flight of stairs?

\* Adapted with permission of the publisher from Fleisher and colleagues.<sup>22</sup>

BP is physiologically variable via diurnal patterns, activity, sleep, talking, pain, exertion, and stress. The danger of brief BP elevation, even with target organ damage, is unknown. Physician-elicited BP rises (stress) increased mean BP an average of 20 mm Hg.<sup>25</sup> Exertional increases of systolic BP have been estimated to be 50 mm Hg for 5 metabolic stress testing with brief elevations to 320/250 mm Hg with leg presses.<sup>26,27</sup> Although BP elevation during dental procedures due to stress has not been well documented, these marked physiological elevations suggest that elevations due simply to stress are possible.

BP is variable throughout a 24-hour period, as shown in multiple 24-hour ambulatory BP monitor studies, with diurnal patterns. The variations from peak BP measurement to sleep measurements are more elevated in patients with known HTN and especially with isolated systolic HTN. Variations of 60 through 100 mm Hg for systolic and 50 through 70 mm Hg diastolic in hypertensive 24-hour ambulatory BP monitoring are seen routinely.

Because BP variation is physiological, should a level of BP elevation result in cancellation of a procedure that may last approximately 1 hour ( $1.43 \times 10^6$  of a person's life, based on an 80-year life expectancy)? Perhaps risk stratification and not BP readings should be used for outpatient procedures.

### ANESTHESIOLOGISTS' PERSPECTIVES

When assessing patients before surgery, anesthesiologists consider several factors. First, the nature of the procedure is evaluated for urgency and risk. Despite being a nonurgent case, high-risk procedures typically require an inpatient setting, general anesthesia, and invasive monitoring. Low-risk procedures, such as dental or oral surgery, can occur in an outpatient setting, often using procedural sedation or local anesthesia alone. Next, patient comorbidities should be assessed. Patients with severe pulmonary and cardiac disease may still be considered inappropriate for outpatient surgery.

Anesthesiologists use the American College of Cardiology/American Heart Association Guideline on Preoperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery for risk stratification and necessary preoperative testing.<sup>28</sup> These 2014 guidelines focus on active cardiac conditions, functional capacity, and congenital diseases. According to the guidelines, patients undergoing low-risk surgery, whose cardiac disease is medically optimized and who remain asymptomatic, need no further evaluation before proceeding with a low-risk surgery. Therefore, it can be extrapolated that a patient arriving with HTN on the day of a low-risk procedure, such as a tooth extraction, can proceed, provided that he or she lacks symptoms such as a headache, chest pain, or vision changes.

Results of a 2015 review on the management of comorbidities in ambulatory anesthesia failed to find increased morbidity from HTN in the outpatient setting.<sup>28</sup> The researchers suggest that the goal during anesthesia be to prevent extreme swings in BP, as patients with long-standing HTN tend to

have an exaggerated BP response to anesthetic agents. Therefore, patients with HTN in the immediate preoperative period can undergo sedation for outpatient dental and oral surgery procedures safely, as long as the procedural sedation is administered properly and cautiously.

## CONCLUSIONS

Lacking study-based evidence indicating when to cancel dental or other outpatient procedures, we suggest updating recommendations on the basis of our opinion to avoid the unnecessary (financial, social) costs of cancellation.

A preoperative BP reading less than 180/110 mm Hg without angina pectoris or acute congestive heart failure signs and symptoms is not an indication for canceling or postponing a dental procedure.<sup>20</sup>

For patients whose correctly measured BP is greater than 180/110 mm Hg, risk assessment should be addressed, as suggested in **Box 2**. If the patient has at least 1 affirmative answer from both category A and category B, the procedure may proceed. Lacking an affirmative answer from category A and category B, immediate discussion with the primary care provider is suggested to discuss the risks of cancellation versus the benefits of proceeding with the treatment. Regardless of the above, all patients with BP greater than 180/110 mm Hg need to follow-up with the health care provider managing their HTN. ■

Dr. Yarows is an internal medicine and hypertension physician, IHA, and a clinical professor of internal medicine, Michigan Medicine, 128 Van Buren St, Chelsea, MI 48105, e-mail [steven\\_yarows@ihacares.com](mailto:steven_yarows@ihacares.com). Address correspondence to Dr. Yarows.

Dr. Vornovitsky is an assistant professor, Department of Anesthesiology and Perioperative Medicine, University of Rochester Medical Center, Rochester, NY.

Dr. Eber is a director of clinical research and a clinical professor of periodontics and oral medicine, School of Dentistry, University of Michigan, Ann Arbor, MI.

Dr. Bisognano is a professor, Division of Cardiology, Department of Internal Medicine, University of Rochester Medical Center, Rochester, NY.

Dr. Basile is a professor of medicine, Seinsheimer Cardiovascular Health Program, Medical University of South Carolina and Ralph H. Johnson VA Medical Center, and a vice chair of clinical programs, Council on Hypertension, Charleston, SC.

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