The Need for Accurate Data on Blood Pressure Measurement in the Dental Office

Merrill F. Elias¹,² and Amanda L. Goodell¹

In this paper we argue that we have a paucity of data about how blood pressure (BP) measurement is performed in the dentist's office. We argue that these data are needed soon, preferably, but in the interim, the following common sense approach to BP measurement will take us a long way toward accurate measurement in the dental office: (i) using automated BP assessment and following the instructions provided by the manufacturers and (ii) using the general BP assessment guidelines provided by the American Heart Association,¹,² among other sources.

Both elements of this common sense approach are necessary as simply following the use instructions provided by the manual cuff manufacturer will often be insufficient to measure BP properly. Articles on measuring BP manually involve rules for traditional methods of measurement using the stethoscope and pressure cuff method. These rules require more training and practice and generally do not apply to automated BP assessment. Thus, we will focus on automated BP assessments which are perfectly acceptable for the dental office.¹

WHY IS DENTAL OFFICE ASSESSMENT OF BP IMPORTANT?

Proper BP measurement in the dental office has taken on increasing importance since at least one state, Texas, now requires BP assessment in dental offices (see Supplementary file 1 online) and many states, including Maine, endorse, and encourage the practice.³,⁴ These endorsements and regulations are of importance because uncontrolled hypertension is a major predictor of mortality, morbidity, physical disability, stroke, and decline in cognitive functioning.⁵,⁶ Consequently, screening for hypertension is a very important function of any medical visit, including one to the dentist. Moreover, BP assessment provides important information to the dentist who will be performing surgical interventions, especially interventions requiring anesthesia.

The American Dental Association (ADA) has endorsed screening for hypertension since 1974.⁷ Its publications include articles facilitating the understanding of the consequences and mechanisms of hypertension, and its importance to dental surgery. However, in our opinion, these documents do not address how BP should be measured in sufficient detail.⁸

For heuristic purposes, let us consider two scenarios. The first is based on our personal experience in the dental office and online discussions, arguably idiosyncratic, and the second is based on the ideal experience.

Scenario one

The patient arrives at the dental office for a cleaning and examination. They fill out a dental and medical history questionnaire, inevitably involving questions on BP history, treatment, and medications. At this visit, and subsequent visits, the patient is placed in the dental chair in a position for dental procedures, feet off the floor and in a semirecumbent position. The hygienist or dental assistant, using an automated wrist or cuff device obtains a single or several systolic and diastolic BP measurements using the patient’s nearest arm. The problem is not the use of an automated device. Use of the automated device reflects a literature indicating that automated arm cuff devices are reliable and the conventional methods using the stethoscope and cuff are unnecessary in the absence of serious comorbidities.⁹-¹² The problem is the positioning of the patient’s body during measurement and errors often introduced by this practice.

¹Department of Psychology, The University of Maine, Orono, ME, USA; ²Graduate School of Biomedical Science and Engineering, The University of Maine, Orono, ME, USA

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Correspondence: Merrill F. Elias (mfelias@maine.edu).

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What are the major problems with measurement in the dental chair? Assuming that the hygienist has read and is following the very simple instructions provided by the automated BP device manufacturer, e.g. legs are not crossed and neither the hygienist nor the patient is talking during the BP recordings, we still see four potential problems with BP measurement in scenario one. The patient’s feet are not flat on the floor; the measuring device may not be positioned correctly relevant to the heart; the arm may not be properly supported; and the measurement may not be taken consistently from the same arm during consecutive visits. The first of these problems, taking the BP measurement in the dental chair, is unique to the dental office as contrasted with most physician/clinic offices. We hypothesize that expediency dictates this practice, i.e. it saves time and does not require additional space.

Possibly the practice has been endorsed rather than discouraged? Khojasteh et al. listed nine recommendations for measuring BP in the dental office, but the first on the list seems unhelpful. “1. Dental assistant takes patient’s BP measurement in the dental chair before the dentist walks in, or in the waiting area before the patient enters the operatory room.” We are unaware of any dental chairs (even in the most upright position) that allow proper measurement of BP with the feet flat on the floor and in a sitting position. We would welcome any information to the contrary.

Scenario two: textbook version

After 15 min of rest, the patient’s BP is measured at a table with the automated arm cuff device, the arm is properly positioned in relation to the heart and supported by the table, feet flat on the floor. The procedure is performed on both arms and at least three BP assessments are obtained, sometimes discarding the first if it is high relative to the second two. In an alternative to this procedure, the properly instructed patient, left alone in a quiet and private room takes his or her own BP. This alternative procedure is now used widely in Canada and reduces white-coat hypertension.

Personally, we have not experienced scenario two, but one cannot assume it is not employed despite personal experience to the contrary and interactions between other patients via website. Very likely scenario 2 is typical in some dental offices, but we have no data from studies that would allow us to confirm this hypothesis.

Choice of the automated arm cuff device reflects knowledge of the literature indicating that it is more reliable than the wrist device. The latter is more susceptible to movement and the wrist arteries are narrower. Typically, BP values obtained with the wrist cuff are higher.

Again, we stress that we have no data bearing on the prevalence of the procedures described in the two scenarios; a major objective of our paper is to argue the need for these data.

DO PATIENTS COMPLAIN?

Patients complain on internet blogs about dental office visits personally, but the work of Frosch et al. indicates that, in general, patients are reluctant to disagree with or complain to the health care professionals because they do not want to be viewed as difficult patients. Absence of complaints is not the best index of lack of concern. Patients may not complain, but some may not return. Scientific data on how many patients are made uncomfortable by unusually high BP values or obviously incorrect procedures are needed.

In our own experience, admittedly anecdotal and via internet, the dental assistant assures the patient that if there is doubt or a question about the BP it will be remeasured at a table per device instructions. Thus, in the vernacular of the day: “it is all good” if we get a valid BP when we remeasure it. In our opinion it is not all good and there are compelling reasons for “getting it right” the first time. Very simply, a rise in BP can be a learned response. In scientific terms, a rise in BP is easily learned via classical conditioning. Rise in BP is the conditioned response and the dental practitioner becomes the stimuli and the BP rise is the response after a few pairings in time. This becomes more than an annoying phenomenon if the patient is denied treatment because of elevated BP.

WHERE ARE OUR DATA?

This is an appropriate and critical question. How is BP measured in dental offices? Our curiosity inspired an extensive search of papers on this topic. Supplementary file 2 online summarizes the search engine and the search strategy. In addition to a systematic search, we reviewed reference sections in all papers recovered and inspected for references to relevant papers.

We found articles about benefits of screening for hypertension in the dental office beginning in the 1970s, willingness of dentists and their patients to screen and be screened for high BP and other diseases, but little if anything about how, specifically, BP measurement is properly accomplished in the dental office.

We were able to find two promising survey research studies. Unfortunately, neither took their survey questions far enough to meet our need for data. In the first, Ramaprasad et al. surveyed 737 dentists with respect to BP measurement practices. Eleven percent of the dentists discontinued BP assessment, giving insufficient time and false positive indications as major reasons. Unfortunately, Ramaprasad et al. did not inquire as to how the BP measurements were recorded. However, discontinuing BP measurements because of false positives is consistent with inadequate or inaccurate BP assessment.

A survey paper by Hughes et al. had a very promising title: “Blood pressure screening practices of a group of dental hygienists.” A number of questions were asked about BP measurement practices. Sixty-seven dental hygienists (81 percent) indicated that the procedure was emphasized in their dental curriculum, but of these respondents, 49 percent felt that there was too little time in the appointment period for BP measurement. Seven percent felt uncomfortable with their skills.

Regrettably, the Hughes study provides no data on questions of how BP was measured, what devices were
employed, or where it was measured (dental chair, a separate room, in the examining room), and we cannot find any follow-up study after 2004.

INDIRECT EVIDENCE FROM THE MEDICAL LITERATURE

One might infer that good BP measurements techniques by medical health care professionals are adapted by dental care professionals. However, this inference is wrong. One finds many papers in the medical literature that lament poor BP measurement practices in the physician’s office and clinic.\textsuperscript{6,28,29} Kallioinen et al.\textsuperscript{28} report that BP measurement errors are common in medical practice and that systematic reviews of the literature have reported bias in records of measurement associated with 27–29 sources of error. Just this year the American Heart Association has published a scientific statement on accurate measurement of BP practices in relation to common sources of error.\textsuperscript{2}

In a study by Abbasi et al.\textsuperscript{30} only one of 159 medical students met all 11 criteria (proper steps) for a proper BP check and the average number of steps performed properly was 4.1. More than one-half of the students made the following errors: patient’s feet not flat on the floor, failure to ask the patient not to use their cell phones or read during the procedure, failure to check BP in both arms, failure to note the arm with the higher BP, and failure to recommend which arm should be used in the next examination. Importantly, Abbasi et al.\textsuperscript{30} reported finding no evidence that the measurement methods improve when student doctors become practicing physicians. Abbasi et al.\textsuperscript{30} argue that very often poor models were provided by practicing physicians they worked with in their practicum and internship experiences. The article, among others, emphasizes exhaustive efforts to teach proper methods in the formal medical school curriculum.

In summary, papers addressing errors in BP measurement in the physician’s office or in the clinic do not support the notion that the problem is unique to the dental office nor that physician practices offer hope for better measurement, albeit current publications strongly support the need for improving of BP measurement methods.\textsuperscript{2}

IMMEDIATE SOLUTIONS IN ABSENCE OF DATA

There is no need to wring our hands in frustration while we wait for data. The devices used in the Sprint trial of BP (please see Supplementary file 2 online) are highly recommended,\textsuperscript{13} but are costly. Much less expensive devices will measure BP with reasonable accuracy if the directions are followed. Proper measurement does demand proper space for taking the BP, and a table and chair of “normal” height. As noted previously, self-assessment by the patient alone in the room after instruction avoids white-coat hypertension (or “green coat hypertension”) and has been found to provide accurate measurements.\textsuperscript{15}

We argue the importance of obtaining data on how, specifically, BP is measured in the dental office. The question is stimulated by personal experience, internet communications, and indirect attempts to recognize poor practices and improve methods in medical offices.\textsuperscript{2}

We offer some immediate solutions while we wait for these data. A separate room for assessing BP via the automated cuff device is among them, and following the directions provided by the manufacturers of the devices would seem a simple and practical approach to accurate BP assessment in the dental office. The need for data extends beyond the dental office to all professional practices, e.g. eye examinations, where BP assessment is recommended or mandatory.

SUPPLEMENTARY MATERIAL

Supplementary data are available at American Journal of Hypertension online.

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Dr. Elias is a Fellow of the Council of High Blood Pressure the American Heart Association and of the editorial boards of the American Journal of Hypertension and Hypertension. Ms. Goodell has no disclosures.

REFERENCES

1. American Heart Association. Steps for Accurate BP Measurement 2018. https://www.heart.org/-/media/health-topics/high-blood-pressure/tylenol-hbp/aha_toolkit_poster_final_102618.pdf?la=en&hash=99C0774B66645F9797360582E56CEF3575273D5. Accessed 15 December 2019.
2. Muntner P, Shimbo D, Carey RM, Charleston JB, Gaillard T, Misra S, Myers MG, Ogedegbe G, Schwartz JE, Townsend RR, Urbina EM, Viera AJ, White WB, Wright JT Jr. Measurement of blood pressure in humans: a scientific statement from the American Heart Association. Hypertension 2019; 73:e35–e66.
3. Maine Board of Dental Practice. Policy Guidance #2016-05—Recordkeeping Guidelines 2016. https://www.maine.gov/dental/documents/BoardPolicy2016-05-Recordkeeping.pdf. Accessed 6 December 2019.
4. Scope of Practice Policy. Dental Hygienists and Dental Hygiene Therapists in Maine 2017. http://scopeofpracticepolicy.org/o-h-providers/dental-hygienists-dental-hygiene-therapists-maine/. Accessed 6 December 2019.
5. Elias MF, Goodell AL, Dono GA. Hypertension and cognitive functioning: a perspective in historical context. Hypertension 2012; 60:260–268.
6. Hwang KO, Aigbe A, Ju HH, Jackson VC, Sedlock EW. Barriers to accurate blood pressure measurement in the Medical Office. J Prim Care Community Health 2018; 9. doi:10.1177/2150132718816929.
7. American Dental Association. Minutes of House of Delegates. Current Policies and Historical Publications, 1974. https://www.ada.org/
8. Burger D. New Guidelines on Hypertension Lowers Threshold 2017. https://www.ada.org/en/publications/ada-news/2017-archive/november/new-guideline-on-hypertension-lowers-threshold. Accessed 15 December 2019.
9. Myers MG, Godwin M, Dawes M, Kiss A, Tobe SW, Grant FC, Kaczorowski I. Conventional versus automated measurement of blood pressure in primary care patients with systolic hypertension: randomised parallel design controlled trial. BMJ 2011; 342:d286.
10. Khazan E, Hough A. A modern method to monitor office blood pressure. Innov Pharm 2017; 8:Article 10. https://pubs.lib.umn.edu/innovations/vol8/iss4/10
11. Khojasteh S. The Use of Automated Office Blood Pressure Devices in the Dental Practice 2015. Oralhealth. https://www.oralhealthgroup.com/features/the-use-of-automated-office-blood-pressure-devices-in-the-dental-practice/. Accessed 6 December 2019.
12. Williams B. Time to abandon clinic blood pressure for the diagnosis of hypertension? Circulation 2016; 134:1808–1811.
13. Myers MG. Automated office blood pressure-incorporating SPRINT into clinical practice. Am J Hypertens 2017; 30:8–11.
14. Myers MG. Automated office blood pressure measurement. Korean Circ J 2018; 48:241–250.
15. Myers MG, Asmar R, Staessen JA. Office blood pressure measurement in the 21st century. J Clin Hypertens (Greenwich) 2018; 20:1104–1107.
16. Casiglia E, Tikhonoff V, Albertini F, Palatini P. Poor reliability of wrist blood pressure self-measurement at home: a population-based study. Hypertension 2016; 68:896–903.
17. Sheps SG. 2019. Wrist Blood Pressure Monitors: Are They Accurate? Mayo Clinic 2019. https://www.mayoclinic.org/diseases-conditions/high-blood-pressure/expert-answers/wrist-blood-pressure-monitors/faq-20057802. Accessed 15 October 2019.
18. Songinthewind. What Happened with My Blood Pressure? City-Data.com 2008. http://www.city-data.com/forum/health-wellness/225903-what-happened-my-blood-pressure.html. Accessed 15 October 2019.
19. Frosch DL, May SG, Rendle KA, Tietbohl C, Elwyn G. Authoritarian physicians and patients’ fear of being labeled “difficult” among key obstacles to shared decision making. Health Aff 2012; 31:1030–1038.
20. Reiff S, Katkin ES, Friedman R. Classical conditioning of the human blood pressure response. Int J Psychophysiol 1999; 34:135–145.
21. Wexler HK, De Leon G. Classical conditioning of human systolic pressure: replication and extension using three stimulus durations. Pavlov J Biol Sci 1979; 14:20–30.
22. Patterson FD. Dental Care Denial Unfair, Unwarranted 2010. Bangor Daily News (Special). https://bangordailynews.com/2010/01/28/opinion/dental-care-denial-unfair-unwarranted/. Accessed 15 October 2019.
23. Southerland JH, Gill DG, Gangula PR, Halpern LR, Cardona CY, Mouton CP. Dental management in patients with hypertension: challenges and solutions. Clin Cosmet Investig Dent 2016; 8:111–120.
24. Guarino MA, Giovannoli SM, Berman CL. Hypertension detection by dentists. Health Serv Rep 1973; 88:291–294.
25. Greenberg BL, Kantor ML, Jiang SS, Glick M. Patients’ attitudes toward screening for medical conditions in a dental setting. J Public Health Dent 2012; 72:28–35.
26. Ramaprasad R, Carson PH, Congdon EB, Barta PJ, Ziskin LZ. Dentists and blood pressure measurement: a survey of attitudes and practice. J Am Dent Assoc 1984; 108:767–771.
27. Hughes CT, Thompson AL, Browning WD. Blood pressure screening practices of a group of dental hygienists: a pilot study. J Dent Hyg 2004; 78:11.
28. Kallioinen N, Hill A, Horswill MS, Ward HE, Watson MO. Sources of inaccuracy in the measurement of adult patients’ resting blood pressure in clinical settings: a systematic review. J Hypertens 2017; 35:421–441.
29. A-Court C, Sheppard, J, Greenhalgh T. Blood pressure measurement: a call to arms. Br J Gen Pract 2015; 66:552–553.
30. Abbasi J. Medical students fall short on blood pressure check challenge. JAMA 2017; 318:991–992.