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▶ APPENDIX

The study is presented in more detail in the online version of this article.

Letters to the Editor

Reference Values for Central Blood Pressure



We recently read with great interest the study in the *Journal* by Cheng et al. (1) on central (aortic) arterial blood pressure thresholds. We highly appreciate the ongoing work of our colleagues in this research field and agree that the establishment of event-based cutoff values for central systolic pressures is an important step forward. In addition, we acknowledge the difficulties getting there. Studying this impressive piece of work, we noticed that the calibration procedures for deriving central pressure differed between the derivation and validation groups. In particular, brachial mean and diastolic pressures versus brachial systolic and diastolic pressures were applied for calibration in the derivation and validation groups, respectively. This approach is susceptible to biased estimation of central blood pressure. Indeed, several research groups showed independently that these 2 methods of calibration may lead to absolute differences in central systolic pressure estimation of up to 15 mm Hg against each other and compared with catheter measurements (2–4), independent of measurement device and method. This has to be added to difficulties in estimating the “true” mean blood pressure; either using integrated brachial waveforms, readings from the oscillometric device, or simple 0.33 or 0.4 formulas. In our experience, using mean and diastolic pressure leads to similar readings as those retrieved from pressure-sensor-tipped catheters, whereas the other approach underestimates aortic systolic pressure (3). Thus, the potential error in central blood pressure reading might be large and might compromise classification of patients.

Another issue unclear from their paper is whether their Cox model adjusting for central pressure also adjusted for brachial pressure. In previous major outcome studies, this was not done (5). Are their central blood pressure thresholds independent of, that is to say adjusted for, brachial pressure? Keeping these fundamentals in mind, a large reference value project for central pressures, involving more than 85,000 individuals, is nearly completed, and will provide complimentary information to the data provided by our esteemed colleagues, particularly regarding central systolic pressures, obtained with different techniques.

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Please note: Prof. Weber has received research grants for validation studies and honoraria as speaker from I.E.M. GmbH. Drs. Wassertheurer and Hametner are employees of AIT Austrian Institute of Technology, which develops methods for pulse wave analysis and blood pressure measurement for manufacturers of medical devices; and are inventors and patent holders of the ARCSolver algorithm, used to derive central waveforms and pressures in cuff sphygmomanometers. Profs. Boutouyrie and Laurent have received research grants, honoraria as a speaker or chairman, or consultation fees for advisory board participation from the following manufacturers: Alam Medical, Atcor Medical, Esaote-Pie Medical, and Omron. Ms. Herbert and Prof. Cruickshank have reported that they have no relationships relevant to the contents of this paper to disclose.

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Reply

Reference Values for Central Blood Pressure



We thank Dr. Weber and colleagues for their interest in and comments on our paper (1) and are delighted that they also agree that establishment of event-based cutoff values for central blood pressures (BP) is an important step forward.

In the derivation cohort of our study, central BP were estimated, with carotid BP derived from carotid pressure waveforms calibrated to cuff brachial mean blood pressure (MBP) and diastolic blood pressure (DBP). By contrast, central BP in the validation cohort was obtained from radial pressure waveforms calibrated to cuff brachial systolic blood pressure (SBP) and DBP, and a validated generalized transfer function using the SphygmoCor device (AtCor