The Hawksley random zero sphygmomanometer

Should be abandoned

EDITOR,—The two most common sources of interobserver variation in the measurement of blood pressure are measurement bias and digit preference. It is to reduce these errors that use of the Hawksley random zero sphygmomanometer is advocated. Once again, however, the accuracy of this instrument has been questioned, and it seems that, rather than reducing bias, this sphygmomanometer underestimates the true blood pressure.[1]

The manufacturer claims that "operator bias is eliminated from the measurement" (manufacturer's promotional literature), but even this has been questioned by the results of a small, informal study.[2] In a much larger study we have confirmed that observer bias and digit preference are not eliminated by use of the Hawksley sphygmomanometer.[3]

During a multicentre, double blind trial of a new antihypertensive agent 3621 measurements of blood pressure were made. Hawksley random zero sphygmomanometers that either were new or had been serviced immediately before the study were used. The investigators were asked to round up their measurements to the nearest 2 mm Hg, use Korotkoff phase V to estimate diastolic pressure, and use a large cuff where appropriate. The study was carried out in 20 centres (seven hospitals and 13 general practices); a total of 173 patients attended a clinic on up to seven occasions. Each centre's preference for the terminal digit was examined for the three measurements random zero, systolic blood pressure, and diastolic blood pressure with the χ^2 test.

In only three centres was no preference for the terminal digit detected. In the remaining centres five showed a preference in all three measurements, eight showed a preference in two measurements, and four centres showed a preference in one measurement. Zero was the digit chosen most commonly. These data reinforce the view of Conroy and colleagues that use of the Hawksley random zero sphygmomanometer should be abandoned.

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Repeat experiment exonerates instrument

EDITOR,—Rónán M Conroy and colleagues correctly say that the zero muddler was designed to reduce observer bias in the measurement of blood pressure.[1] In a previous report on the Hawksley instrument the same group of researchers described an experiment in which two observers were separated from each other in booths, one with a mercury sphygmomanometer and the other with a Hawksley sphygmomanometer: the two instruments were connected by a T tube to a third booth, where there was a "controller" and a patient with a cuff on his arm.[2] The controller inflated the cuff, auscultated the arm, and gave "auditory clues" to the observers when the systolic and diastolic pressures were reached. The observers wrote down the mercury levels on their respective sphygmomanometers. After five measurements on each of 10 patients the Hawksley results were lower than those for the standard instrument by a mean (SD) of 5·1 (3·5) mm Hg for systolic and 3·9 (3·0) mm Hg for diastolic blood pressure. The researchers concluded that it verges on the scandalous that vast sums have been spent gathering data with an inaccurate instrument.

Rose *et al* classified observer error in sphygmomanometry into three categories: systematic error, terminal digit preference, and observer prejudice.[3] We have repeated the experiment described above in a format which enables us to distinguish between inaccuracy in the instrument and observer error. The two sphygmomanometers, connected to the same cuff on a subject's arm, were placed side by side, and the movement of the mercury columns as the cuff was deflated was recorded by a video camera. The video tape was then viewed by observers who repeatedly used the pause facility on the video recorder to compare the readings on the two instruments at exactly the same instant. Within the limits of the resolution of the video tape the two instruments gave exactly the same reading, at every time interval, when the zero error was allowed for.

We must therefore ask why Conroy and colleagues are so convinced that the Hawksley instrument underestimates blood pressure. Could it be observer prejudice?

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Manufacturer fights back

EDITOR,—Nowhere in their article on measurement error associated with the Hawksley random zero sphygmomanometer do Rónán M Conroy and colleagues give any theoretical explanation of why they think that there is a variance and on what grounds they make their allegations.[1] In their second paragraph the authors mention their previous report entitled "Inaccuracy of the random zero sphygmomanometer."[2] After that report's publication staff from Hawksley and Sons visited the blood pressure unit of Beaumont Hospital to discuss with Professor Eoin O'Brien and his colleagues the issues raised and the test methods used, and we explained why we thought that the discrepancies had arisen. We also emphasised the need for people using the random zero sphygmomanometer to be correctly trained. It was suggested that we should resubmit instruments for validation studies, but we had to decline this because of the costs.

I would like to point out that previously O'Brien and O'Malley said: "The random-zero sphygmomanometer is an accurate instrument that eliminates a major source of error—namely, observer bias—and the principle might be developed further and incorporated in many standard sphygmomanometers."[3]

The random zero sphygmomanometer has been subject to over 20 years of constant evolution and improvement. To make it work in a similar fashion to a standard sphygmomanometer we have produced a mark II model with a smaller capacity and a variance of 0-20 mm. This has a lower reservoir, which shortens the inflation time, and the operator needs to wait only long enough for the column to stabilise, not for five seconds. This new model is quicker to operate because the chamber is filled at a lower inflation level; this results in less discomfort for the patient and less venous congestion. This is important when working with children or elderly people.

As Hense has pointed out, there could well have been a "methods" problem with the use of the previous models.[4-6]

I was disappointed to read such a biased article.

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Don't condemn it without proper evidence

EDITOR,—We believe that Rónán M Conroy and colleagues' article on the Hawksley random zero sphygmomanometer presents a less than balanced view.[1] The authors quote other workers who have tested the accuracy of the instrument but do not quote their figures. We have tabulated them and present them with the findings of the Dublin group (table).[2-6]

It becomes evident that there is, indeed, a

Advice to authors

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