

Summary

Hawksley random zero sphygmomanometer was designed to eliminate observer bias and two digit preference. We have measured blood pressure in a group of 62 young adults (median age 26.1 years, range 20.2 to 31.3) with reflux nephropathy under standardised conditions (i.e. in the morning, after a 2 hour supine rest, before venepuncture, using a standard 12x23cm adult size cuff appropriate for the machine used) utilising the random zero sphygmomanometer and the automatic oscillometric blood pressure monitor (Dinamap™ 8100, Critikon). Seven consecutive recordings of right brachial blood pressure at two minute intervals were taken using each instrument alternatively, and the first reading was discarded. The first instrument used to measure blood pressure was alternated between patients to eliminate bias on instrument preference. Random zero sphygmomanometer was used as recommended by the manufacturers and Korotkoff phase V was used to measure the diastolic blood pressure (DBP). The observer and the equipment used were the same throughout the study period. The mean systolic and diastolic blood pressure was calculated to the nearest 1 mmHg utilising the 3 recordings taken by each instrument. The limits of agreement and the repeatability coefficients for each method of measurement were assessed utilising the statistical method described by Bland and Altman in 1986.

Results: The correlation coefficients among random zero and automatic oscillometric blood pressure monitor for systolic blood pressure (SBP) and diastolic blood pressure measurements were 0.84 and 0.67 respectively. The average blood pressure (mean of random zero and automatic oscillometric blood pressure monitor measurement) plotted against the difference between the two methods of measurement showed no relationship between the difference and the average of measurement in the ranges of blood pressure studied i.e., between 100 - 160mmHg systolic and 55 - 100mmHg diastolic. The mean of difference between random zero and automatic oscillometric blood pressure monitor for SBP was -6.45 (SD 6.07) and for DBP +10.77 (SD 8.16) mmHg. The limit of agreement for SBP measurement was, +5.69 to -18.59mmHg. and for DBP was +27.09 to -5.55. The repeatability coefficients of random zero and automatic

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oscillometric blood pressure monitor for systolic and diastolic measurements were 8.64 and 7.04 for systolic and 9.72 and 6.62 for diastolic respectively.

Conclusion: Bland & Altman analysis indicates major differences between the two methods of measurement. The automatic oscillometric blood pressure monitor could on average over read the systolic by 6.45mmHg and under read the diastolic by 10.77mmHg compared to that of random zero. Furthermore the limits of agreement were wide enough for a normotensive to be inadvertently defined as an hypertensive on machine error alone. This clearly indicates that automatic oscillometric blood pressure monitor and random zero blood pressure measurements cannot be used interchangeably in clinical practice. Furthermore, the repeatability coefficients, which should ideally be zero, are too large for either instrument to be considered as the gold standard for blood pressure measurement, although that of automatic oscillometric blood pressure monitor was superior to that of random zero. This study highlights the importance of using nomograms generated by the same method of measurement for comparison both in paediatric and adult practice for correct interpretation of blood pressure.

Key words. blood pressure measurement, Hawksley random zero sphygmomanometer, automatic oscillometric blood pressure monitor.