COMPARISON OF MEDICAL DEVICES USED FOR BLOOD PRESSURE AND BLOOD GLUCOSE MEASUREMENT

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Introduction

The advent of medical devices that could be used to monitor blood pressure and blood glucose levels within a point-of-care testing scenario or by the patient within a self-monitoring exercise has revolutionised the management of hypertension and diabetes. The number of medical devices which offer the possibility for point-of-care testing or patient self-monitoring has increased over the past decade. However, clinical usefulness of measurements of clinical parameters may be jeopardised due to the medical device used.[1]

Aim

To compare medical devices used for point-of-care testing and patient self-monitoring of blood pressure and blood glucose levels.

Method

- **A single-site, single-visit comparison of four blood pressure monitors (ICO medical Mercury Sphygmomanometer, S+K Manuell 50 KC Aneroid Sphygmomanometer, A&D Medical UA-767 Plus Digital, Hartmann HG140 Digital) and four blood glucose meters (Accu-chek Active, Glucometer Elite, One Touch Horizon, Major II) was carried out. Approval to carry out the study was obtained from the University of Malta Research Ethics Committee.**
- **100 volunteers (> 18 years) who were recruited from a community pharmacy and accepted to participate were divided into two groups of 50 patients; one group for the blood pressure devices comparison and the second group for the blood glucose devices comparison.**
- **Each patient used all devices for that arm of the study (blood pressure monitors or blood glucose meters). Comparison of results obtained by the different medical devices was carried out using the Paired Sample t-test and the Pearson Correlation Coefficient. Each device was assessed for ease of use, advantages and disadvantages.**

Results

Blood Pressure Monitors	Blood Pressure (mmHg)	
	Mean Systolic (stand. deviation)	Mean Diastolic (stand. deviation)
Mercury Sphygmomanometer	120.50 (25.68)	79.10 (16.03)
Aneroid Sphygmomanometer	120.80 (25.96)	79.50 (16.33)
Digital upper arm (A&D Medical)	119.62 (27.35)	78.42 (15.42)
Digital wrist (Hartmann)	121.34 (25.70)	76.48 (15.22)

Table 1: Mean systolic and diastolic readings for the four monitors (n=50)

Patient demographics (n=50): mean age 47 years (range 18-87), 31 females, 13 had a history of hypertension.
Systolic and diastolic blood pressure readings ranged from 81mmHg to 179mmHg and 51mmHg to 105mmHg respectively.

There was a statistically significant difference between the diastolic blood pressure values recorded for the Hartmann digital wrist monitor and all the other three monitors ($p<0.05$). The best correlation (0.994) was obtained between the mercury and the aneroid sphygmomanometer. The Hartmann Digital was the easiest to use but yielded the least reliable values whereas the digital upper-arm monitor A&D Medical UA-767 Plus is easy to use by patients and gives results that better correlate with the mercury and aneroid sphygmomanometer.

Patient demographics (n=50): mean age: 48.7 years (range 18-87), 32 females,18 were diabetics.
The blood glucose results ranged from 3.2 mmol/L to 19.4 mmol/L.
The lowest blood glucose level was recorded by Accu-Chek whilst the highest was recorded by Major II.

Blood Glucose Meters	Blood Glucose (mmol/L) (standard deviation)
Accu-chek Active	7.466 (3.352)
Glucometer Elite	7.644 (3.344)
OneTouch Horizon	7.750 (3.316)
Major II	8.120 (3.285)

Table 2: Blood glucose levels for the four meters (n=50)

There was a statistically significant difference between the blood glucose levels obtained by the different meters with Major II giving high blood glucose readings ($p<0.05$). Glucometer Elite and OneTouch Horizon showed the best correlation whilst Accu-chek Active and Major II showed the least correlation. OneTouch Horizon and Accu-chek Active require a smaller blood sample size and display results much faster compared to the other two meters.

Discussion

From the correlation analysis and user-friendly characteristics of the medical devices, the A&D Medical UA-767 Plus blood pressure monitor, though showing a lower correlation compared to the mercury sphygmomanometer, is the most patient friendly and cheaper option that should be recommended for patient use. The OneTouch Horizon glucose meter is easy to use for point-of-care settings or for patient self-monitoring.

Reference

1. Rivers SM, Kane MP, Bakst G, Busch RS, Hamilton RA. Precision and accuracy of two blood glucose meters: FreeStyle Flash Versus One Touch Ultra. Am J Health-Syst Pharm 2006; 63: 1411-1416.

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