

# Blood pressure measurement - Does anyone do it right?: An assessment of the reliability of equipment in use and the measurement techniques of clinicians

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## Abstract

**Objective.** *To assess the accuracy and consistency of blood pressure measurement techniques among individual clinicians and the reliability of the equipment in everyday use.*

**Design.** *Professional survey.*

**Participants.** *The senior nurse at each of 28 clinics was sent two questionnaires about equipment, and 55 health professionals were sent a questionnaire about their measurement technique.*

**Main outcome measures.** *Faulty equipment, date of last service, named individual responsible for equipment, knowledge of protocols regarding mercury spillage, correct technique for measuring blood pressure, training in blood pressure measurement.*

**Results.** *An 82% response rate on equipment showed it to be in relatively good condition, although maintenance problems and some potentially dangerous health and safety issues were highlighted. A 67% response rate on measurement technique showed that there was considerable variation in individual measurement technique that could lead to inappropriate action.*

**Comment.** *This study has led to replacing all mercury with aneroid devices, and to the development of staff guidelines and updating on measurement techniques. A re-audit will be carried out to complete the cycle.*

therefore even a modest increase in risk has the potential to affect large numbers of women. Several reports from the World Health Organisation Collaborative Study of Cardiovascular Disease and Steroid Hormone Contraception<sup>1-3</sup> provided strong evidence that measuring blood pressure, even if only done once prior to commencing contraceptive hormone use, was a major factor in reducing the risk of cardiovascular disease. An earlier consensus statement<sup>4</sup> and subsequent guidance<sup>5</sup> on combined oral contraceptive use also highlighted the importance of accurate blood pressure measurement.

But how well do we measure blood pressure? Anecdotal evidence suggests considerable variation in individual technique. One published study<sup>6</sup> evaluating a group of junior hospital doctors suggests that nearly one third of the group had no formal training in blood pressure measurement, and many demonstrated poor clinical technique. Recommendations from the British Hypertension Society<sup>7</sup> were used as a standard to assess both the equipment in use and the measurement techniques employed.

## Method

Assessment was by means of three questionnaires, two relating to equipment and one relating to measurement technique. Initial drafts were reviewed by a number of senior medical and nursing staff to identify and exclude ambiguities, leading questions, etc. Concern was initially expressed that some members of staff might perceive the assessment of their clinical technique as threatening. In an effort to combat this, the plans and aims of the project were outlined in our monthly staff magazine well in advance, and all staff were encouraged to take part. An explanatory letter accompanied each questionnaire.

To assess the equipment in everyday use, two types of questionnaires were sent to the senior nurse at each clinic. The first was short and related to numbers and types of sphygmomanometers, responsibility for maintenance and protocols for dealing with accidental mercury spillage. One of these was completed for each clinic. A second, longer questionnaire, dealing with more specific questions, was completed for each sphygmomanometer.

A further questionnaire was sent to each doctor and nurse working within the Directorate. This asked specific questions relating to the individual's normal practice when measuring blood pressure.

No attempt was made to differentiate between doctors and nurses to further reduce any perceived threat.

## Results

### Equipment

Equipment questionnaires were sent to 28 clinics. Of these, 23 were returned (response rate of 82%) giving information on a total of 52 sphygmomanometers. Fewer than 8% of sphygmomanometers and stethoscopes were shown to have some fault. However, 88% of devices had no indication of

## Key message points

- Although a commonly performed task, many doctors and nurses may not measure blood pressure accurately.
- Inaccurate blood pressure readings may lead to inappropriate clinical action with potentially serious consequences for clients.
- Regular review of equipment is important in terms of both maintenance and health and safety issues.

## Introduction

The Women's Health Directorate provides a specialist, community-based contraception and reproductive health care service in Liverpool. Working from some 28 clinics, we provide approximately 60 clinic sessions per week, handling 60 000 consultations per year.

An in-house case conference raised issues about the relevance of blood pressure readings in determining clinical decision making, and led to a discussion about the accuracy and consistency of such measurements. As a result, it was decided to audit the measurement technique of clinicians and the reliability of equipment in use within the Directorate.

## Background

Most contraceptive hormone users are healthy individuals with a low risk of cardiovascular disease. Even though adverse events occur infrequently within such a group, these events tend to have more serious implications for the individual when they do occur. Very large numbers of women use contraceptive steroid hormones world-wide,

when they were last serviced. In 87% of clinics there was no individual named person responsible for maintenance. Of the 52 sphygmomanometers in use, 90% contained mercury. However, only 26% of clinics stated that there was a protocol, easily accessible to all staff, outlining how to deal with an accidental mercury spillage. When individual clinicians were asked what they would do in the event of a mercury spillage, some 30% seemed blissfully unaware of any potential health risk.

### Measurement technique

Questionnaires on measurement technique were distributed to 55 doctors and nurses. Of these, 37 were returned completed (a response rate of 67%). The results showed considerable variation among clinicians.

Only 51% used the recommended arm position, with 32% saying that there was no need to support the arm.

Only 24% reduced cuff pressure at the recommended rate of 2-3 mmHg per second. Thirty-five percent read diastolic pressure routinely at Korotkoff 4 (the muffling of sounds) instead of Korotkoff 5 (the disappearance of sounds), as recommended.

More than half of the clinicians admitted rounding off readings to the nearest 5 mmHg or 10 mmHg rather than the recommended 2 mmHg.

With reference to the auscultatory gap, 46% of clinicians were unaware of its significance, whilst a further 43% said they did not record it. (The auscultatory gap is the temporary disappearance of sounds between the systolic and diastolic which may be mistaken for the initial onset of sounds, giving a falsely low systolic reading.<sup>7</sup>)

When asked about training in blood pressure measurement, 84% had had no formal training in the last 10 years and 3% admitted to never having had any formal training.

### Discussion

The literature supports the importance of reliable blood pressure measurement. Inaccurate readings may lead to inappropriate action, with potentially serious consequences for our clients. This study highlights factors which could contribute to such inaccuracies.

Whilst equipment generally appeared to be in relatively good condition, the problems with maintenance were unexpected. The results relating to mercury spillage and relevant protocols raised potentially serious health and safety issues.

Assessing a practical procedure by questionnaire alone has obvious limitations, and the inclusion of an observational component to the study may have provided more information. However, the results of the questionnaire on measurement technique do confirm marked variation amongst clinicians, with the potential to introduce significant errors in blood pressure readings.

A number of problems have been identified, all of which potentially impact on basic client care, and steps have been taken to address these. Within our service, all mercury-containing equipment has now been replaced with aneroid devices, covered by regular service contracts. A summary of the study findings was written up for inclusion in the Directorate's monthly staff magazine and this generated considerable informal discussion. Using the guidelines,<sup>7</sup> a basic measurement technique, adopted to suit our client population, was drawn up and this was demonstrated to all clinical staff attending a routine update meeting. In due course, a re-audit will be carried out to reassess the situation, thereby completing the cycle.

What initially seemed like a rather trivial project turned out to have been a very worthwhile exercise.

### Statements on funding and competing interests:

**Funding.** National Co-ordinating Unit for Clinical Audit in Family Planning.

**Competing interests.** None.

### References

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- 6 Feher M, Harris-St John K, Lant A. Blood Pressure Measurement by Junior Hospital Doctors - a Gap in Medical Education. *Health Trends* 1992; **24** (2): 59-61.
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### Editors comment

For further reading about the correct technique for blood pressure measurement, I recommend the following BMJ Clinical review: Beevers G, Lip G, O'Brien E. Blood pressure measurement Part III - Conventional sphygmomanometry: technique of auscultatory blood pressure measurement. *BMJ* 2001; **322**: 1043-1047. This article has been adapted from the newly published 4th edition of ABC of Hypertension available from BMJ bookshop and at [bmjbooks.com](http://bmjbooks.com).