The clinical interpretation of blood pressure readings taken in pharmacies

(Word count: 1331 excluding references)

Hypertension is the most common, preventable risk factor for cardiovascular events worldwide (1) and affects almost a third of all adults in England. (2, 3) Epidemiological data suggest that a 10mmHg reduction in systolic blood pressure (BP) across the population, regardless of baseline cardiovascular risk, could result in a 41% reduction in risk of stroke and 22% reduction in coronary heart disease. (4) Despite this, only half of diagnosed hypertensive patients on treatment are deemed to have adequately controlled BP. (2) Largely due to its asymptomatic nature, Public Health England estimate around 5.6million adults in England are unaware of having elevated blood pressure - known as undiagnosed hypertensives. (5)

In September, community pharmacies up and down the country have been offering free blood pressure checks to thousands of members of the public as part of “know your numbers” week.(6) In preparation, the staff at the Oxfordshire pharmacy where I practice were keen to know more about blood pressure measurement protocols, how to interpret the readings they were about to obtain and what advice to give patients.

In the October 2017 issue of the *Journal of Hypertension*, we presented a systematic review and meta-analysis of published evidence that aimed to answer some of these questions. (7) The study compared community pharmacy blood pressure (CPBP) measurements with general practitioner (GP) clinic, home blood pressure monitoring (HBPM) and ambulatory blood pressure monitoring (ABPM) readings in the same patients.

Evidence for the role of pharmacists in hypertension care

There is sufficient evidence to suggest that pharmacist management or pharmacist and GP co-management of hypertension can reduce blood pressure compared to usual care alone. For instance, a systematic review of randomised controlled trials identified 16 studies of ‘*community pharmacist interventions on control of BP in hypertensive patients’*.(8) The nature of the interventions across the studies included: establishing and improving adherence to blood pressure medications, early identification of drug related problems and side effects, optimal drug selection for individual patients, and practical diet and lifestyle advice including stop smoking schemes.

Across the studies, systolic blood pressure reduction in the pharmacy intervention arms were clinically significant, showing a -6.1 mmHg (95% CI -8.4 to -3.8) difference over usual

GP care. In context, an antihypertensive drug such as a thiazide diuretic, prescribed at a normal maintenance dose, is expected to decrease systolic blood pressure by 8mmHg on average. (4)

Furthermore, targeted cardiovascular risk assessments in pharmacies have shown potential in screening and referring high risk patients to general practice. (9)

Given this information and the more clinical roles pharmacists are developing, the ability to accurately take and interpret blood pressure has arguably never been more important.

Standardising BP measurements in pharmacies

Variations in blood pressure measurement techniques can have a substantial effect on blood pressure readings and hence clinical decisions. Table 1 shows some of the common factors that can influence readings and their estimated effect on blood pressure results.

In our review, mean CPBP was calculated from a wide range of visits to the pharmacy (1 to 5 visits) as well as from a range of repeat readings taken per visit (2 to 6 readings) within each study. Furthermore, the protocol for calculating the mean (e.g discard first reading or not) and the member of the pharmacy team taking the readings varied.

The effect of these differences were partially reflected in the systolic blood pressure comparisons which suggested that the more readings and repeat visits, the closer the correlation between pharmacy and out of office measurements. (7) Higher numbers of repeat readings have been shown to lead to a ‘regression to the mean’ effect and hence a closer relationship to the multiple readings taken via HBPM and ABPM. (10)

Table 1 – Common factors that can affect blood pressure during consultations

Factors	Estimated Average Effect On Systolic Blood Pressure (mmHg)
Patient talking during measurement (11)	+17
Full bladder/urge to urinate during measurement (12)	+15
Consumption of alcohol in the 3 hours prior to reading(13)	+8
Legs crossed during readings (14)	+7
Observed reading vs Unattended reading (patient alone in the consultation room) (15)	+5 to +16
Consumption of caffeinated drink 1 hour prior to reading (16)	+3 to +15
Cuff one size too small (17)	+2 to +6
No arm support during reading (18)	+2

The differences in the way blood pressure was measured across the studies highlighted the fact that, currently, neither the Royal Pharmaceutical Society (19) nor the World Health Organisation (20) in their documents recommend a standardised protocol for the measurement of blood pressure in pharmacies.

With workloads in pharmacies increasing, asking patients to return to the pharmacy on several occasions within a short period of time may not be convenient for either party. Equally, taking up to 6 repeated blood pressure measurements (with a 1 minute break between each) may be time consuming and not conducive to an effective overall consultation. Therefore our study recommends a pragmatic approach to measurements, involving triplicate readings, discarding the first and taking an average of measurements two and three when the initial reading is deemed high.

Some studies used non-validated monitors to estimate CPBP such as wrist devices. (21) We encourage pharmacy teams and patients to ensure that their BP monitors are validated by verifying this on the British and Irish Hypertension Society website (22) and ensuring manual devices are used in patients with atrial fibrillation.

How should we interpret blood pressure readings taken in pharmacies?

Thresholds of 140/90mmHg (GP clinic) and 135/85mmHg (daytime ABPM/HBPM) are currently adopted for hypertension diagnosis and management among non-diabetic adults under the age of 80 years. (23, 24) The Royal Pharmaceutical Society and the World Health Organisation have previously recommended the 140/90mmHg threshold for the diagnosis of elevated blood pressure in pharmacies. (19, 20) This threshold, however, is based on the assumption that pharmacies, as clinically related settings, are associated with the same 'white coat effect' as GP clinics, rather than on diagnostic accuracy or comparison studies.

Pooled analysis in our systematic review showed no significant difference between CPBP and daytime ABPM readings [mean difference 1.6mmHg (95%CI -1.2 to 4.3) and mean BP recorded in pharmacies were significantly higher than 24-h ABPM readings [mean difference 7.8mmHg (95% CI 1.5 to 14.1)]. In other words, pharmacy readings were shown to be no different to daytime ABPM readings, and higher than 24-hour ABPM readings. This pattern was further confirmed with the CPBP/home comparison [mean difference 2.4mmHg (95% CI 0.0 to 4.8)] where no clinically significant difference (±5mmHg) was observed.

The three comparisons above indicate that CPBP may be best interpreted using out of office BP thresholds (i.e 135/85mmHg) rather than the commonly adopted 140/90mmHg clinic threshold. In keeping with this interpretation, we would expect CPBP readings to be

significantly lower than GP clinic measurements – however this was not observed and no significant difference was found [mean difference -0.9mmHg (95% CI -3.5 to +1.7)].

The reasons for this inconsistency lie partly in the variety of blood pressure measurements used in the studies. For example, only two of the six studies comparing GP clinic with pharmacy readings were taken by GPs themselves. The rest involved either nurses, research assistants or automated unattended measurements. To exemplify the potential impact of these differences, a systematic review demonstrated that clinic readings taken by nurses can be up to −7.0mmHg [95% CI −4.7 to −9.2]) lower than GP measured readings. (25)

Conclusion

Currently, elevated blood pressure readings taken in community pharmacies result in either referral to a general practitioner or advice to the patient, rather than formal diagnosis or regular monitoring. Given this context and the data we have found, CPBP readings may be best interpreted using the home/daytime ABPM threshold for the diagnosis and management of hypertension (135/85mmHg).

This approach would likely result in a higher sensitivity (true positive rate) for detecting hypertension when referring patients to their general practitioner with borderline elevated blood pressure, albeit at the expense of specificity (false positive rate). To avoid an increase in general practitioner workload through inappropriate referral, pharmacies could consider directing patients toward home or daytime ABPM directly to further refine referral criteria after elevated CPBP readings.

Staff at the pharmacy where I practice were able to successfully engage with the ‘know your numbers’ week, offering blood pressure measurements and advice to help patients reduce their BP, and have continued to do this beyond the promotional week. If pharmacies can continue to demonstrate their value in hypertension detection and management, we hope that future service development can be focussed on setting up the necessary infrastructure to formally allow pharmacists to manage patients with hypertension from community settings.

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