

Self-monitoring blood pressure in hypertension, patient and provider perspectives; a systematic review and thematic synthesis

Benjamin R. Fletcher^a, Lisa Hinton^a, Jamie Hartmann-Boyce^a, Nia W. Roberts^b, Niklas Bobrovitz^a, Richard J. McManus^a

Author affiliations:

^aNuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK.

^bBodleian Health Care Libraries, University of Oxford, Oxford, UK.

Corresponding author at: Benjamin Fletcher

Address: Nuffield Department of Primary Care Health Sciences, University of Oxford, Radcliffe Observatory Quarter, Woodstock Road, Oxford, UK.

Email: benjamin.fletcher@phc.ox.ac.uk

Tel: +44 (0) 1865 289 323

Highlights

- Qualitative Systematic review of SMBP from patient and clinician perspectives
- SMBP allowed patients to attribute changes in their BP to lifestyle changes
- SMBP empowered patients and facilitated discussion with clinicians
- Areas of uncertainty would benefit from clarification in guidelines
- Future research to focus on optimising the use of SMBP in the clinical encounter

Abstract

Objective

To systematically review the qualitative evidence for patient and clinician perspectives on self-measurement of blood pressure (SMBP) in the management of hypertension focussing on: how SMBP was discussed in consultations; the motivation for patients to start self-monitoring; how both patients and clinicians used SMBP to promote behaviour change; perceived barriers and facilitators to SMBP use by patients and clinicians.

Methods

Medline, Embase, PsycINFO, Cinahl, Web of Science, SocAbs were searched for empirical qualitative studies that met the review objectives. Reporting of included studies was assessed using the COREQ framework. All relevant data from results/findings sections of included reports were extracted, coded inductively using thematic analysis, and overarching themes across studies were abstracted.

Results

Twelve studies were included in the synthesis involving 358 patients and 91 clinicians. Three major themes are presented: interpretation, attribution and action; convenience and reassurance v anxiety and uncertainty; and patient autonomy and empowerment improve patient-clinician alliance.

Conclusions

SMBP was successful facilitating the interaction in consultations about hypertension, bridging a potential gap in the traditional patient-clinician relationship.

Practice implications

Uncertainty could be reduced by providing information specifically about how to interpret SMBP, what variation is acceptable, adjustment for home-clinic difference, and for patients what they should be concerned about and how to act.

Keywords: Self-monitoring; hypertension; qualitative

1. Introduction

Evidence from randomised controlled trials (RCTs) shows that self-monitoring blood pressure (SMBP), either alone or as part of a complex intervention, is effective in achieving blood pressure (BP) reduction and better BP control in patients with hypertension [1-3]. In trials patients who self-monitor compared to usual care, on average have lower BP at 6 months (-3.9mmHg systolic [$p<0.001$], -2.4mmHg diastolic [$p<0.001$]), and this effect is increased when SMBP is used with additional support such as provision of educational materials, electronic transmission of BP data, telecounseling, etc. [3]. While SMBP has been shown to be effective at improving BP over periods of 6-18 months, there is currently little information as to whether it has any impact on longer-term outcomes such as cardiovascular outcomes or death, although modelling the impact of the blood pressure effects is likely to be cost effective intervention in the longer term [4].

For SMBP to achieve an effect on BP, it is likely that regular monitoring initiates or supports behaviour change in patients, the healthcare professionals managing their condition, or both. Potential mechanisms through which SMBP may be successful include improvements in medication adherence and lifestyle factors in patients, and helping overcome clinical inertia in clinicians[5]. Evidence from RCTs shows an association between SMBP use and medication adherence, however the evidence for lifestyle change remains equivocal[6].

Recent clinical guidelines have included recommendations for the use of SMBP in the diagnosis of hypertension and in monitoring BP control (i.e. UK NICE 2011, ESH/ESC Europe 2013). However it is unclear to what extent the patient and clinician voice, particularly with regard to acceptability and use in “real-world settings” have been incorporated. When evaluating health technologies, data on effectiveness and cost-effectiveness are often prioritised and as such, reviews demonstrating the efficacy of SMBP have often ignored the needs, views and perceptions of patients and physicians. With a current focus in healthcare on patient-centred care, trials now often include a qualitative component to elicit the views and preferences of patients, and sometimes clinicians. However systematic reviews regularly do not include these data, leading to a loss of the patient and physician voice, and along with it the context within which interventions may or may not work. Methods for synthesising qualitative evidence and incorporating qualitative evidence in broader reviews have been developed, and are becoming more commonplace [7, 8]. This review complements recent reviews of the effectiveness of SMBP, by also presenting a synthesis of the available evidence on patient and clinician beliefs and preferences. Evidence is drawn from daily practice (i.e. ‘real-world’) settings, or linked to involvement in trials or intervention/program development.

Exploring what works and what is acceptable to both patients and professionals is crucial to optimising SMBP interventions for use in real-world settings. The objectives of this review were to investigate: the motivation for patients to start self-monitoring; how patients and clinicians use SMBP to promote behaviour change; the perceived barriers and facilitators to SMBP use by patients and clinicians; as well as communication and interaction between the two parties.

2. Methods

The methods are described in detail in the protocol that was developed and registered on the PROSPERO database.[9] The ENTREQ (enhancing transparency in reporting the synthesis of qualitative research) framework was used to report the results of the review, and includes items grouped into five domains: introduction and methodology, literature search and selection, appraisal, and synthesis of findings (Appendix 1).[10]

2.1 Information sources and study selection

Electronic databases (Medline, Embase, PsycINFO, Cinahl, Web of Science, SocAbs) were searched from inception to July 2014 to identify qualitative studies that examined the perspectives of patients with hypertension, or the healthcare professionals managing their care, on the use of SMBP. The search strategy was developed in Medline and translated for use in the other databases (Appendix 2). Forward and backward citation searches were carried out on any studies included following the electronic database searches.

Studies were eligible if they:

- included ambulatory patients with hypertension or the healthcare professionals managing their care
- were based in primary care, outpatient clinics or the community
- Investigated perspectives of self-monitoring of blood pressure
- reported the results of primary qualitative research (i.e. interviews, focus groups, ethnography)

Two reviewers independently screened the reports for inclusion looking first at title and abstracts (BF, JHB). Full text articles were obtained for studies that appeared to meet the inclusion criteria, or studies where a definite decision could not be made.

2.2 Quality assessment

Two Reviewers independently assessed each included report using the Consolidated Criteria for Reporting Qualitative Health Research (COREQ) framework (BF/NB), which has criteria relating to: research team and reflexivity; study design; and analysis and findings.[11]

2.3 Data extraction

Data extraction was first carried out using an adaptation of the JBI QARI form for interpretive research (Joanna Briggs Institute qualitative assessment and review instrument).[12] The form allowed broad themes to be identified from the studies, which were used to guide the first stage of analysis.

All text was extracted from sections labelled as 'results' or 'findings' in the included reports and entered into QSR NVivo 10 software for qualitative thematic analysis.

2.4 Synthesis

Systematic reviews of qualitative data should go further than simply describing the identified research to translating the findings into new theories to answer the research question. It has been argued that three criteria are the foundation of good qualitative reviews: interpretation of subjective meaning; description of social context; and attention to lay knowledge [13]. This review is consistent with these methodological aims.

Thematic synthesis was chosen as it uses methods that are established for the analysis of primary data, and translates them for use in systematic reviews.[14] Line-by-line coding was carried out on relevant data by one researcher (BF) and agreed throughout by discussion with a second (LH). Initial descriptive codes were grouped into related areas to construct descriptive themes. Abstracted analytical themes were then developed by BF and refined in collaboration with LH and RM. Coding was inductive, with theme development directed by the content of the data. Wherever possible quotes from the participants of included studies (primary data) have been presented to demonstrate the analytical themes; where participant quotes were not available author interpretations have been included. Quotes are presented followed by information about the individual (i.e. patient, clinician, author interpretation), and setting (i.e. study in 'daily practice' setting, linked to a trial, or part of intervention development).

3. Results

3.1 Searches

Database searches yielded 668 articles, with two additional records from citation searches. Following removal of duplicates and title and abstract screening, 45 full text articles were assessed and 12 articles met the selection criteria [15-26]. (PRISMA diagram, Figure 1)

3.2 Study characteristics

The characteristics of included studies are presented in Table 1. Some studies included more than one population and/or more than one methodology.

Eleven studies involved patients (n=358), and five involved healthcare professionals (n=91). The earliest article was published in 2003 with the majority (8/12) published during the last five years. Seven studies took place in the UK, two in USA, and one each in Malaysia, Canada, and Sweden. Eight studies used interviews and five used focus groups.

Five studies were qualitative studies embedded within RCTs testing SMBP interventions; three were part of SMBP intervention/programme development; and the remaining four investigated SMBP use in “daily practice” settings.

3.3 Quality assessment

The comprehensiveness of reporting across studies is presented in Table 2. Reporting varied, with studies reporting between 13-25 of the 32 items in the COREQ checklist. The domain including research team and reflexivity was not generally well reported, with no item reported by more than half of the studies. The experience and training of the interviewer/facilitator, and their characteristics with regard to bias, assumptions and interest in the research topic were only reported by one study each.

The second domain regarding study design was better reported with the exception of: the presence of non-participants (1 study); the presence of repeat interviews (0 studies); and the return of transcripts to participants for comment/correction (1 study). The methodological orientation underpinning the study was only reported in 2 studies.

The final domain, analysis and findings, was generally well reported, with the exception of: the description of the coding tree (3 studies), participants providing feedback on finding (1 study), and the use of software for analysis (5 studies).

3.4 Thematic synthesis

Initial coding produced 65 descriptive codes which were grouped into three broad analytical themes. The first is pragmatic and describes how patients and clinicians use SMBP, how they interpret the results, to what patients attribute high/low/change in BP, and what actions are taken based on SMBP. The second theme describes the balance between SMBP being perceived as convenient and reassuring contrasted with the potential for causing anxiety and uncertainty. The final theme deals with patient empowerment, autonomy and self-efficacy, and how SMBP changes the traditional patient-clinician dynamic.

3.4.1 Theme 1 - Interpretation, attribution and action

How patients interpreted their BP and acted upon self-measurement depended to a large extent on their understanding of high BP. While patients were aware of some of the potential risks factors for, and consequences of high BP, many did not know what their target BP should be.

“...people need to know [target BP] because you do get very uncomfortable whether... is this the danger level?” Rickerby (2003) [patient, daily practice]

There was a belief among some patients that BP targets should be personalised to take their individual circumstances into account. Clinicians worked to guidelines, which were perceived to be inflexible in their definition of normal and target BP:

“Clearly, participants were trying to find functional ways to define acceptable ranges of BP values. The guideline values were an initial broad framework for judgements, but within this, the personalised norm was deployed as a more meaningful rule of thumb, especially for those users who had a relatively consistent history of elevated or reduced readings.” Vasileiou (2013) [author interpretation, daily practice]

“The healthcare professionals worked according to national guidelines, but did not use them as a tool to set individual goals. Subsequently, the patients had neither a goal to focus on nor an understanding of the actual blood pressure value.” Bengtsson (2014) [author interpretation, intervention development]

There was a consensus between clinicians and patients that SMBP provided a more accurate picture of BP than casual clinic measurement due to the larger number of measurements, and it was this that led some patients to acquire their own monitor.

"I can't remember if they... if I was advised to go and buy a home monitoring machine, but I decided to do it anyway... I knew that my blood pressure would be checked every time, regularly at the surgery but certainly twice a year... but until that I would like more information than that." Hanley (2013) [patient, intervention development]

However, the improved accuracy of SMBP was tempered by observation of the inherent variation in blood pressure. Patients and clinicians were aware that self-measured blood pressure tended to be lower than clinic measures, which led to a dilemma of which measurement was best to use for treatment. Variation between successive SMBP measurements was also noted, again with uncertainty as to which readings should be used.

"I could do it one minute and then five minutes later it would be completely different." Rickerby (2003) [patient, daily practice]

"It's put us in a bit of a dilemma I think cos we're getting their blood pressures and then when they are doing them at home, they're low, it's difficult isn't it, to know what to do." Jones (2013) [practice nurse, trial]

After using SMBP, patients questioned whether the usual practice of casual clinic measurement was sufficient to provide accurate information.

"Why we need the machine in the house? [...] because our visit to the doctor is infrequent." Abdullah (2011) [patient, daily practice]

Patients often found that high BP had little impact on their daily lives due to the lack of symptoms, and that SMBP gave them an insight into their condition by acting as a proxy for symptoms. SMBP enabled patients to begin to make associations between their BP, symptoms and actions in their daily lives, and were then able to identify ways to self-manage.

"I mean I remember taking my blood pressure and it reading very high and I thought gosh I feel really great at the moment." Rickerby (2003) [patient, daily practice]

"Perhaps because high blood pressure doesn't have proper symptoms. Many think... 'oh, I'm fine'." Bengtsson (2014) [HCP, intervention development]

Some clinicians were concerned that patients were not able to interpret SMBP correctly and might incorrectly attribute some symptoms to their BP.

"...and then you've got others; 'Oh, I feel a bit ill today, I'll better check my BP' ... and I think that's the danger" Hanley (2013) [HCP, trial]

Patients were able to use SMBP to monitor the effectiveness of their medication and changes to their lifestyle. SMBP had an impact on whether patients were adherent, whether they initiated or terminated treatment, and to what extent they tailored treatment. In the absence of symptoms, having SMBP as a symptom proxy helped demonstrate the effectiveness of treatment. Clinicians recognised the benefits of being able to use SMBP in conjunction with clinic measurements to make more rapid adjustments to patients' medication, thus overcoming clinical inertia.

"I think taking my BP regularly really made me show that I did need to take the medication and that was somewhat motivating... it did show that the medication was important."

Lambert-Kerzener (2010) [patient, trial]

As well as monitoring BP in relation to medication use, patients were able to use SMBP to attribute lifestyle factors to high BP, and then in many cases act in response. However, patients were concerned that they only received generalised advice about how lifestyle change could help, and would prefer the information to be tailored to hypertension in particular as well as more personalised or tailored advice.

"When it's high, then I know it's either my diet or I've not been exercising. So when it's high I'll take my walks. I'll do my aerobics and then cut down on meats, go vegetarian." Abdullah (2011) [patient, daily practice]

"What I did do, and I've stuck to it, I've cut out salt. I was overweight a few years ago and I cut out butter, so now I don't have butter and I don't have salt. I just use general knowledge." Hanley (2013) [patient, trial]

"Lifestyle advice was received from multiple sources and perceived to be general rather than being targeted at the reasons for them individually developing hypertension." Hanley (2013) [author interpretation, trial]

One article raised the interesting perspective that patients and clinicians may have different expectations of treatment for hypertension:

"...patients who perceive symptoms they believe are due to high blood pressure should not expect to feel better from the treatment. Rather, the treatment should merely serve to prevent these patients from feeling worse." Bengtsson (2014) [author interpretation, intervention development]

3.4.2 Theme 2 – convenience and reassurance v anxiety and uncertainty

SMBP was seen to be convenient and easy to use by patients, and the process was in some cases even said to be enjoyable. Patients were more relaxed out of the clinic environment, and liked the ability to be able to monitor as and when they wanted. Patients felt reassured by being able to check symptoms that were potentially attributable to elevated BP. Patients trusted the technology of automated BP monitors.

“And it always comes in handy; you feel a little bit dodgy, you can always take it to see what your blood pressure is.” Ovaisi (2011) [patient, trial]

“I am reassured and I feel quite happy with the fact that I know that my blood pressure is ok. I don’t have to think ‘oh God I haven’t been to the doctor in 4 months, I wonder if my BP is alright’ I know it is.” Jones (2012) [patient, trial]

While clinicians recognised that patients were generally positive about SMBP, they were concerned that some might be anxious about the process or results of self-monitoring, potentially becoming neurotic. They also raised concerns about the ability of some patients to be able to manage the process of monitoring.

“I think they get a little bit neurotic about it. You know, they’re checking it every day.” Jones (2013) [HCP, trial]

“... it may not be applicable to patients with poor technical skills or those who were easily ‘over focused’.” Halifax (2007) [author interpretation, intervention development]

Some patients did discuss being anxious, and this was usually in relation to what to do when BP was high. While there is scope for patients to become anxious about high BP readings from self-monitoring, it was recognised that this anxiety can either inhibit or promote action; anxiety is only a bad thing if patients feel that they are unable to do anything about it.

“I would be quite worried if I took it all the time and it was high. I just think that I’m perfectly alright until I go to the surgery in four months’ time. I don’t worry about it. I don’t think about it.” Bostock (2009) [patient, intervention development]

Little evidence was presented that showed patients feeling burdened by the process of self-monitoring (i.e. according to a rigorous protocol), which was a concern of a small number of clinicians.

Uncertainty for both patients and clinicians stemmed from how to interpret the results of SMBP, in particular coping with variability, as well as when and how to act upon the readings. For patients, the main concern was knowing at what point they needed to act.

“Where should it [BP] be? That way I’ll know if me or the missus gotta give a call to an ambulance to come get me... because I don’t know what it’s supposed to be. I don’t know if I should call.” Schmid (2009) [patient, daily practice]

It might be expected that providing clinicians with more accurate BP results would help reduce treatment uncertainty, but this does not seem to be the case. Even when clinicians were provided with clear protocols for treatment, as in trials where medication was titrated based on SMBP, clinicians were still unsure how to manage borderline cases. In the daily practice settings clinicians were unsure how to incorporate SMBP into routine care, which may have been perceived as reticence by patients.

“The only problem I had with it in a way is these people that were coming up as uncontrolled who were one millimetre above the control level. And I just thought, oh come on, are you really going to add in another drug to bring this down?” Hanley (2013) [HCP, trial]

“GPs were inconsistent in how they used patients’ home readings. They reported patients sometimes brought home readings to consultations but not in an organised way and even when GPs asked to see the readings, they did not always incorporate these into decision making.” Jones (2013) [author interpretation, trial]

3.4.3 Theme 3 – patient empowerment, autonomy and self-efficacy, and how SMBP changes the traditional patient-clinician dynamic

Using SMBP increased patients’ involvement in their own care, increased their knowledge about their condition, and empowered them to make changes to benefit/improve their BP. Empowering patients also changed the dynamic of the patient-clinician relationship. Some patients thought that clinicians could be protective of BP results from the clinic, perhaps because the clinicians did not think the patient could understand.

“But when we went for a check-up the doctor rarely tells us the actual BP reading. He did not tell us the readings he just said it’s ok.” Abdullah (2011) [patient, daily practice]

In contrast SMBP was seen to facilitate discussion, creating a clinician-patient alliance with patients better able to understand and be involved in making decisions about treatment. SMBP provided

clinicians with more concrete information rather than what could be sometimes ambiguous symptoms. Patients also thought that if they were self-monitoring they might be taken more seriously by their clinician.

"It's certainly given me more meaningful data to speak to the doctor rather than, 'Well, I think my BP has probably gone up'." Hanley (2013) [patient, trial]

"I think the doctor will observe you're being a bit more serious than vaguely talking about this, that and the other." Vasileiou (2013) [patient, daily practice]

"The knowledge and information (i.e. SMBP measurements) they brought to the visit facilitated a bidirectional conversation that supported their self-care as well as assisted their physicians" Lambert-Kerzener (2010) [author interpretation, trial]

Whilst most clinicians were generally supportive of their patients self-monitoring, some patients met with apparent disinterest from their clinician when they tried to communicate the results of self-monitoring, which was disempowering. The perceived disinterest may have been due to a lack of clear guidance for clinicians as to what to do with data from self-monitoring.

"I went back quite soon after the initial diagnosis just to confirm that everything was okay. I mentioned that I'd purchased this [SMBP], but that was it really. We didn't really speak about it any more than that." Vasileiou (2013) [patient, daily practice]

SMBP combined with an increased knowledge of BP and hypertension resulted in patients demonstrating self-efficacy. Rather than being in a passive role relying on their GP to both measure their BP and dictate treatment, patients felt more in control of their own care.

"Well the strength is that I have better control. And then that in collaboration with others [nurse/physician] becomes a good foundation for judging how to plan the treatment." Bengtsson (2014) [patient, intervention development]

Both patients and clinicians recognised that there was scope for SMBP to decrease the workload of GPs especially in trials where telemonitoring was used, or where medication was titrated based on SMBP by pharmacists, nurses or the patients themselves.

"It's quite nice to see if you can ship out some of the work to, or give the stuff back to the patients to do which if it makes them more involved and helps them understand is ultimately better." Jones (2013) [HCP, trial]

“...maybe just saving time for more serious things and other people.” Rickerby (2003) [patient, daily practice]

4. Discussion and conclusion

4.1 Discussion

This systematic review and thematic synthesis found three overarching themes in the world-wide qualitative literature concerning patient and provider perspectives on self-monitoring of hypertension: interpretation, attribution and action; convenience and reassurance versus anxiety and uncertainty; and patient empowerment, autonomy and self-efficacy, and how SMBP changes the traditional patient-clinician dynamic.

The synthesis covered SMBP use from a broad range of settings, including trials, development of interventions and daily practice, as well as from the perspectives of both patients and clinicians. Only four of the studies represented “real-world” settings where patients and clinicians discussed using SMBP as part of their usual practice [15, 24-26]. It is possible that the participants of studies linked to trials or intervention development would have different perspectives than the wider population. With the growing enthusiasm for SMBP in everyday practice there is a need for further research into the use of SMBP in “real-world” settings, particularly why patients may initiate SMBP, and where it fits into their everyday lives. The results complement systematic reviews of the efficacy of SMBP by providing information on ease of use and tolerability as well as day-to-day experiences of self-monitoring.

Thematic synthesis was chosen as it uses analytical methods from primary qualitative studies, applies them to secondary analysis, and allows the clear identification of prominent themes in a methodologically transparent fashion. As with all qualitative research, the analysis was dependent on self-awareness of the potential impact of prior knowledge and experience (reflexivity). The systematic review was conducted by a research team with a broad range of clinical, qualitative, methodological and health services research experience; and all were involved in the development and interpretation of analytical themes.

Both patients and clinicians reported being uncomfortable with interpretation of SMBP measurements, particularly in light of the variability (between home and clinic; reading to reading in the short and long-term). There was agreement that BP targets were not clear, and that guidelines currently do not allow enough flexibility for more personalised targets and norms. While current UK guidelines are clear about how to use SMBP in the diagnosis of hypertension (i.e. NICE 2011), guidance from the UK and internationally for its use in managing hypertension is less clear, reflecting the underlying evidence [3].

SMBP was described as providing a proxy for symptoms (in the usually symptomless setting of hypertension) allowing patients to link activities of daily life with changes in their BP. Patients were aware that certain lifestyle factors such as diet and exercise could affect their BP, and some even used SMBP to experiment with some of these factors. A recent systematic review found that in RCTs, SMBP is associated with improved adherence, but the evidence for associated lifestyle change was equivocal [6]. Another systematic review of RCTs showed that SMBP was associated with less therapeutic inertia (where medication remains unchanged despite elevated BP), however this was not reported as a major factor by the clinicians in the current review [5].

SMBP was described (by both patients and clinicians) as empowering patients, assisting them in managing their BP. Empowered, or 'activated' patients have been shown to be less likely to frequently attend their healthcare provider for management of their condition, thus potentially reducing burden on clinicians as well as costs [27]. This empowerment had an effect on the traditional patient-clinician relationship, with SMBP reported as facilitating discussion about hypertension and giving patients more understanding. Clinicians recognised the benefits of patient self-monitoring and self-management, but described concern that some patients may become anxious (or even neurotic), despite a lack of corroborating patient views.

SMBP combined with increased knowledge of BP was described as resulting in patients demonstrating increased self-efficacy. This supports the evidence from trials that show that adding educational support to SMBP is more effective than SMBP alone [3]. Interestingly educational interventions have not been proven to be effective in managing hypertension [28], suggesting that SMBP and education may have a synergistic effect. Future research could further investigate the interaction between patient education and SMBP.

As SMBP appears to influence behaviour change in both patients and clinicians, it is important to understand where such an effect is greatest, as this would then provide a logical target for optimisation. Self-monitoring can empower patients and involve them more in their healthcare, as well as provide more accurate and timely information for clinicians, but the precise motivations for starting it will vary from case to case. Targeting the interaction between patients and clinicians around self-monitoring might therefore be a fruitful avenue for future research. This could include considering how SMBP can be used in consultation discussions, particularly in terms of clinician's acceptance and permission giving. There is evidence that many patients may monitor their BP without informing their clinician, and while these patients may have some benefits from self-monitoring in isolation, they should be encouraged to bring the information into the clinical encounter [29]. Improved health

communication has been shown to be associated with better health outcomes in chronic conditions, and is therefore a relevant topic for future interventions [30].

Integrating SMBP into everyday practice remains an issue, with no clear current guidance for clinicians. SMBP provides a potential wealth of information, but how it is recorded by patients and then communicated to clinicians remains ad hoc. Telemonitoring is one method that has been shown to be successful in trials, however this has yet to be rolled out to scale.[31]

4.2 Conclusion

Whilst patients are often aware of the risks of high BP, they can find BP readings and targets confusing. SMBP, often in conjunction with education about BP and hypertension, gives patients a better understanding of their health state, and a proxy for symptoms in order to be able to act. SMBP empowers patients and facilitates discussion with clinicians.

Clinicians recognise the benefits of having a more accurate picture of patients' BP that is provided by self-monitoring, but are often concerned about how their patients may react to having to self-monitor. More guidance is needed as to how to incorporate self-measured BP into routine practice.

Further research should focus on the best protocol for SMBP for managing hypertension, as well as understanding the role SMBP can play in improving the patient-clinician consultation.

4.3 Practice implication

The results of this review suggest that uncertainty for patients and clinicians could be reduced by providing information specifically about how to interpret SMBP, what variation is acceptable, how to adjust for home-clinic difference, and for patients particularly what they should be concerned about and how to act (i.e. when to contact their clinician). Providing educational materials for patients along with self-monitoring may be crucial in optimising the potential health benefits. Future guidance for clinicians should include information on: targets for self-measured BP; how often patients need to self-monitor; how the information should be recorded by patients and communicated to clinicians in a format that can be readily used to guide treatment.

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Table 1 – Characteristics of included studies

Study	Country	Design	Participants	Objectives	Setting	RW/T/ ID
Abdullah (2011) [15]	Malaysia	Interviews (x6) and focus groups (x2)	Patients with hypertension who had self-initiated SMBP (n=24; 6 interview, 18 focus group)	To explore the experiences of purchasing and using SMBP at patients' own initiative	Urban primary care clinic	RW
Bengtsson (2014) [16]	Sweden	Focus groups (x5)	Patients with hypertension (n=15), and healthcare professionals (n=12: 4 nurses, 4 physicians and 4 pharmacists)	To explore and describe relevant aspects of hypertension and hypertension treatment, to be used in the development of an interactive mobile phone self-report system for hypertension self-management	Primary healthcare centre and internal medical outpatient clinic	ID
Bostock (2009) [17]	UK	Focus groups (x3)	Patients with hypertension (n=16), and healthcare professionals (n=25: 3 nurses and 6 GPs)	To establish any concerns patients and clinicians may have about mobile phone based BP monitoring before planning an RCT. To investigate how commonly patients and clinicians made use of home-monitoring results in managing their BP	Four general practices chosen to reflect range of socio-economic conditions.	ID
Halifax (2007) [18]	Canada	Focus groups (x6)	Patients with comorbid type II diabetes and hypertension (n=24) and family practitioners (n=18)	To determine the information needs of patients and clinicians for the design of a telemedicine system	Hypertension clinic, diabetes clinic or family medicine centre	ID
Hanley (2013) [19]	UK	Interviews (x45)	Patients with hypertension (n=25), and healthcare professionals (n=20: 11 nurses and 9 doctors)	To explore the experiences of patients and professionals taking part in a RCT of remote BP telemonitoring supported by primary care. To identify factors facilitating or hindering the effectiveness of the intervention and those likely to influence its potential translation to routine practice.	Six socioeconomically diverse general practices	T
Jones (2012) [20]	UK	Interviews (x29)	Patients with hypertension (n=23) and family members (n=6)	Qualitative study embedded in RCT to explore patients' views of SMBP with self-titration of anti-hypertensive medication	Twenty four general practices	T

Jones (2013) [21]	UK	Interviews (x16)	Healthcare professionals (n=16: 13 GPs, 2 nurses and 1 healthcare assistant)	Qualitative study embedded in RCT to explore health professionals' views and experiences of patient self-management particularly with respect to future implementation into routine care.	Fourteen general practices	T
Lambert-Kerzener (2010) [22]	USA	Interviews (x146)	Patients with hypertension (n=146)	To explore patients' experiences with a multifaceted BP control intervention involving interactive voice response technology, home BP monitoring and pharmacist led BP management	Veterans affairs medical centre and municipal safety net hospital	T
Ovaisi (2011) [23]	UK	Interviews (x26)	Patients with hypertension who had suffered a stroke or TIA in past 9 months (n=26)	From the intervention arm of a community-based RCT of SMBP, to explore patients' experiences of self-monitoring with nurse-led support.	Hospital stroke clinic	T
Rickerby (2003) [24]	UK	Interviews (x13)	Patients with hypertension (n=13)	To investigate the experiences of individuals who had carried out SMBP	Single GP practice	RW
Schmid (2009) [25]	USA	Focus groups (x6)	Patients with a stroke or TIA in the past 24 months (n=28)	To identify BP self-management strategies used by individuals who had suffered a stroke or TIA.	Veterans affairs medical centre	RW
Vasileiou (2013) [26]	UK	Interviews (x18)	Patients – users of SMBP (n=18)	To explore the reasoning behind the interpretation of home readings, and the way people interact with their doctor with reference to these values and the practice of SMBP	Community	RW

*Real-world (RW), linked to trial (T) or intervention/programme development (ID)

Table 2 – Quality assessment using the COREQ checklist

COREQ Domain/Item	Research team and reflexivity								Study design												Analysis and findings											Total (n=32)		
	1. Interviewer/facilitator	2. Credentials	3. Occupation	4. Gender	5. Experience and training	6. Relationship established	7. Participant knowledge of the interviewer	8. Interviewer characteristics	9. Methodological orientation and theory	10. Sampling	11. Method of approach	12. Sample size	13. Non-participation	14. Setting of data collection	15. Presence of non-participants	16. Description of sample	17. Interview guide	18. Repeat interviews	19. Audio/visual recording	20. Field notes	21. Duration	22. Data saturation	23. Transcripts returned	24. Number of data coders	25. Description of the coding tree	26. Derivation of themes	27. Software	28. Participant checking	29. Quotations presented	30. Data and findings consistent	31. Clarity of major themes		32. Clarity of minor themes	
Abdullah 2013 [15]	Y	N	N	Y	N	N	N	N	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	19	
Bengtsson 2014 [16]	N	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	N	Y	Y	N	Y	N	Y	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	16	
Bostock 2009 [17]	N	N	N	Y	N	N	N	N	N	Y	N	Y	N	Y	N	Y	N	N	Y	Y	Y	N	N	N	Y	N	N	N	Y	Y	Y	Y	11	
Halifax 2007 [18]	N	Y	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	N	N	N	N	Y	N	N	N	N	Y	Y	Y	14
Hanley 2013 [19]	Y	N	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	25	
Jones 2012 [20]	N	Y	Y	Y	N	N	N	N	N	Y	N	Y	Y	Y	N	Y	N	N	Y	Y	Y	Y	N	N	N	Y	N	N	Y	Y	Y	Y	17	
Jones 2013 [21]	N	Y	Y	Y	N	N	N	N	N	Y	N	Y	Y	Y	N	Y	N	N	Y	Y	Y	Y	N	Y	N	Y	N	N	Y	Y	Y	Y	18	
Lambert-Kerzener 2010 [22]	Y	Y	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	N	Y	N	N	Y	N	Y	N	N	Y	N	Y	N	N	Y	Y	Y	Y	17	
Ovaisi 2011 [23]	N	Y	Y	Y	N	N	N	N	N	Y	N	Y	Y	Y	N	Y	N	N	Y	Y	Y	N	N	Y	N	Y	Y	N	Y	Y	Y	Y	18	
Rickerby 2003 [24]	Y	N	N	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	Y	N	Y	N	Y	N	N	Y	Y	Y	Y	19	
Schmid 2009 [25]	N	Y	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	N	Y	N	N	Y	N	N	Y	N	Y	N	Y	N	N	Y	Y	Y	Y	16	
Vasileiou 2013 [26]	Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	N	Y	Y	N	Y	N	N	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	15	

Total (n=12)	5	6	4	12	1	0	0	1	2	12	8	12	8	9	1	12	5	0	12	6	9	8	1	7	3	11	5	1	11	11	12	12	
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Figure 1 - PRISMA 2009 Flow Diagram

