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## Patients' experiences of self-monitoring blood pressure and self-titration of medication:

the TASMINGH2 trial qualitative study

### Abstract

#### Background

Self-management of hypertension, comprising self-monitoring of blood pressure with self-titration of medication, improves blood pressure control, but little is known regarding the views of patients undertaking it.

#### Aim

To explore patients' views of self-monitoring blood pressure and self-titration of antihypertensive medication.

#### Design and setting

Qualitative study embedded within the randomised controlled trial TASMINGH2 (Telemonitoring and Self Management in the Control of Hypertension) trial of patient self-management of hypertension from 24 general practices in the West Midlands.

#### Method

Taped and transcribed semi-structured interviews with 23 intervention patients were used. Six family members were also interviewed. Analysis was by a constant comparative method.

#### Results

Patients were confident about self-monitoring and many felt their multiple home readings were more valid than single office readings taken by their GP. Although many patients self-titrated medication when required, others lacked the confidence to increase medication without reconsulting with their GP. Patients were more comfortable with titrating medication if their blood pressure readings were substantially above target, but were reluctant to implement such a change if readings were borderline. Many planned to continue self-monitoring after the study finished and report home readings to their GP, but few wished to continue with a self-management plan.

#### Conclusion

Participants valued the additional information and many felt confident in both self-monitoring blood pressure and self-titrating medication. The reluctance to change medication for borderline readings suggests behaviour similar to the clinical inertia seen for physicians in analogous circumstances. Additional support for those lacking in confidence to implement prearranged medication changes may allow more patients to undertake self-management.

#### Keywords

family practice; hypertension; qualitative research; self blood pressure monitoring.

### INTRODUCTION

Raised blood pressure is a key risk factor for cardiovascular disease, the leading cause of death worldwide.<sup>1</sup> Despite improvements in blood pressure over recent years, in both Europe and the US nearly half of patients receiving treatment are not controlled below guideline targets.<sup>2,3</sup> Several factors contribute to this shortfall in optimum care, including poor adherence to medication by patients, clinical inertia where physicians fail to act on raised blood pressure readings, and problems at a health-system level.<sup>4</sup>

Self-management, including self-monitoring and self-titration, has the potential to address several of these aspects of suboptimal hypertension management: self-monitoring reduces blood pressure and is associated with increased adherence to medication.<sup>5,6</sup> The additional effect of self-titration on blood pressure seems likely to be mediated, at least in part, by cutting out clinical inertia, and reorientating care in this patient-centred fashion could herald a new era in hypertension treatment.<sup>7</sup> However, little is known about patients' views in this novel area.

One previous interview study of people undertaking self-monitoring found variable knowledge about hypertension and

discordant views on the advisability of hypothetical self-titration.<sup>8</sup> A survey of patients in a pilot study of self-measurement and self-titration in hypertension found that 81% were satisfied with the programme, although this study used a fixed titration regime and lasted only 8 weeks.<sup>9</sup>

Self-management is effective in terms of blood pressure reduction,<sup>7</sup> but further information on the patient perspective is required prior to any implementation on a wider scale. This qualitative study, embedded within the TASMINGH2 (Telemonitoring and Self Management in the Control of Hypertension) trial, aimed to explore the views and experiences of those who had undertaken blood pressure self-management.

### METHOD

#### TASMINGH2 trial

The trial methodology and main results have been reported elsewhere.<sup>7</sup> Five hundred and twenty-seven patients aged 35–85 years, with poorly controlled treated hypertension, from 24 practices, were randomised to self-monitoring with self-titration of antihypertensive medication and telemonitoring, or to usual care. The

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**Submitted:** 14 February 2011; **Editor's response:** 4 August 2011; **final acceptance:** 3 October 2011.

#### ©British Journal of General Practice

This is the full-length article (published online 30 Jan 2011) of an abridged version published in print. Cite this article as: **Br J Gen Pract 2012; DOI: 10.3399/bjgp12X625201.**

## How this fits in

Self-monitoring has a small but significant effect on blood pressure control, and home readings may better predict complications due to hypertension compared to office measurements. The TASMINH2 (Telemonitoring and Self Management in the Control of Hypertension) trial showed that self-titration of antihypertensive medication by patients, based on self-monitored blood pressures, was effective in lowering blood pressure compared to controls. In this study, giving patients the ability to measure their own blood pressure and the knowledge to interpret their readings enabled them to make an informed choice over whether to increase their medication. Patients were often willing to increase their medication when their blood pressure readings were substantially raised, but were reluctant to do so when their readings were borderline normal/raised.

intervention is summarised in Box 1. The findings of the trial were that intervention patients had 5.4/2.7 mmHg lower blood pressure after 12 months, and used more medication, and the majority made at least one change to their treatment.<sup>7</sup>

### Recruitment of interview participants

Purposive sampling was used to select participants who had undertaken the intervention for interview, to include a range of characteristics including: age, sex, deprivation, blood pressure change during study, medication changes, and support from a family member to carry out the study.

## Box 1. Summary of the TASMINH2 trial intervention

### Intervention patients

- Given a blood pressure monitor (Omron 705IT) and a modem (i-modem, Netmedical, NL) to transmit their readings to the research team
- Attended two training sessions run by the research team (45–60 minutes each)
- Attended a medication review with GP at the start of the study to discuss potential medication changes and devise a titration plan to be implemented as required
- Measured their blood pressure daily for 1 week each month taking two readings 5 minutes apart each morning while sitting quietly
- Coded the second readings as:
  - 'green' (normal: systolic 101–130 mmHg and diastolic <86 mmHg)
  - 'amber' (raised: systolic 131–200 mmHg or diastolic 86–100 mmHg)
  - 'red' (high or low: systolic >200 mmHg or <101 mmHg, or diastolic >100 mmHg)
  - (lower target for those with diabetes or chronic kidney disease)
- Were advised to contact their GP surgery if any readings were high or low ('red')
- Four or more 'amber' readings per month was classed as 'amber', and two consecutive 'amber' months triggered a medication change
- Patients could implement a medication change without further need to contact their GP by putting a red sticker on their repeat prescription request form

### Control patients

- Received usual hypertension care from the GP and/or practice nurse
- Attended a standard medication review with the GP at the start of the study

In qualitative research, it is common practice to take an iterative approach and be responsive to, and incorporate, emerging findings from the data.<sup>10</sup> Initially, a maximum variety sample was aimed for, but it became apparent that how patients approached decisions about adjusting their medication was an important issue. Sampling subsequently focused on patients whose blood pressure results were such that they were expected to make medication changes. Later interviews took place when patients had completed the study, to ensure all decisions on medication changes had been finalised. Recruitment continued until no new emerging themes were identified.

### Interviews

Interview questions were developed through discussion within the research team, and covered knowledge and understanding of blood pressure, experience of blood pressure self-monitoring, experience of medication management, and preference for self-management or usual care. Interviews were semi-structured and took place in patients' homes, except for one patient who chose to be interviewed at their surgery. Patients gave signed informed consent, as did other family members who were present at an interview and wished to contribute. Interviews lasted 30–60 minutes and were audiorecorded and transcribed.

### Analysis

Each transcript was checked for accuracy against the tape. Analyses of family members and patients' views were combined, as patients and family members were interviewed together. Transcripts and field notes were read to identify the main themes and subthemes. Initial themes were identified independently and discussed by the authors, followed by theme development and refinement using a constant comparative method.<sup>11</sup> Each transcript was read again to identify where themes were mentioned, and a brief synopsis of what each interviewee had said for each theme was entered on a chart to enable comparison for understanding and interpreting the data.

## RESULTS

### Participants

Twenty-six patients were approached, and 23 (88%) agreed to be interviewed. Six family members were present and participated, giving a total of 29 interviewees in 23 interviews. Twenty-one interviews were conducted by one researcher and two by two other researchers. Six interviews were

**Table 1. Characteristics of interviewed patients**

Characteristic	
Mean age, years (range)	70 (49–84)
Men, n (%)	13 (57)
IMD <sup>a</sup> 2007 score, median	13.5
Mean blood pressure <sup>b</sup> , mmHg	
Baseline	159/84
12 months	135/76
Marital status, n (%)	
Married/cohabiting	21 (91)
Widowed	2 (9)
Occupation (missing data = 1), n (%)	
Professional/managerial and technical	13 (57)
Skilled manual and non-manual	3 (13)
Partly skilled and unskilled	2 (9)
Unemployed/unwaged	4 (17)
Previous home monitoring	12 (52)
Number of medication changes made	
0	6
1	5
2	4
3	3
4	4
5	1

<sup>a</sup>Index of Multiple Deprivation 2007 based on patient's postcode. <sup>b</sup>Measured in trial clinics.

conducted between the 6- and 12-month follow-up clinics, and the others followed completion of the trial procedures. Patient characteristics are shown in Table 1. Interviewees were similar to trial participants in age, sex, deprivation, and employment category.<sup>7</sup>

### Key themes

The themes that emerged were organised into three key interrelated areas: understanding blood pressure and attitudes to medication, self-titration of medication, and continuing the intervention after the trial. To reflect the issue of medication change, information on this is included with each quote to contextualise the patients' views.

#### Understanding blood pressure and attitudes to medication

Patients' perspectives on managing their medication were framed by their understanding of their blood pressure, and this changed following training and experience of the trial.

#### Blood pressure monitoring

Patients felt that home blood pressure readings were more 'natural' than surgery readings, as they were more relaxed at home and the readings were taken more carefully and under controlled conditions.

Many were surprised at how much their readings varied, and some suggested that changing their medication based on fewer readings was not appropriate, due to this variability. This led them to question whether a GP should adjust a patient's medication after taking a single reading:

*'I was amazed how much they varied. That was very educational. I mean okay if there's a crisis or something, you expect your blood pressure to go up, but I could take them just sitting there and it was just amazing the difference in them.'* (P29, F, 78, made medication change 1, medication change 2 postponed)

By the end of the study, patients were confident about measuring their blood pressure and interpreting their readings:

*'I actually passed a comment that he [GP] was taking my blood pressure in the wrong arm and that he shouldn't talk to me when he is doing it ...'* (P2, F, 60, no medication changes needed in 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 gawd I haven't been to the doctor for 4 months, I wonder if me blood pressure is alright?" I know it is.'* (P9, M, 64, no medication changes needed in trial)

Few reported using the monitor outside of the study protocol, for example to check their blood pressure at a different time of day or after they had changed their medication. The blood pressure monitor was rarely used by other family members, and then only on a few occasions.

#### Perception of the risks of hypertension

All the patients knew that high blood pressure can cause heart attacks and strokes, and a few also mentioned kidney problems and death. However, almost all considered that they personally were not at risk, generally because their blood pressure was treated (although not necessarily controlled to target) or because they had no symptoms:

*'I have to say I didn't take it that seriously because, obviously you know what it's like with blood pressure, you don't feel ill or anything like that ... If you've got a symptom or something you'll think, "ooh that shouldn't be happening" but if it doesn't, you don't bother ... because it had actually come down to an acceptable level I was obviously*

*apparently in no sort of danger or anything.*' (P9, M, 64, no medication changes needed in trial)

*'Well my father had a stroke, and my mother had a heart attack, but I don't know. I suppose I would have been at risk if it hadn't have been picked up.'* (P24, F, 71, made one medication change but no further changes, due to side effects)

### **Attitudes to blood pressure medication**

Patients reported being adherent to their medication and rarely missed taking tablets. They were aware that if they increased their medication, it was likely to be for the rest of their life, and hence they were reluctant to do this. Those who had experienced side effects gave this as a reason for not wanting to increase or change their medication:

*'Whatever I am prescribed I take. I religiously take no matter where I am, I take the tablets.'* (P15, M, 70, made five medication changes)

*'I would prefer not to have to take tablets but in the situation I'm in, I'm happy to take them.'* (P20, M, 73, made four medication changes)

*'... doctors will say "oh yes, try that" and well, I can't quite accept that, you know. I think it's expecting too much of the body to just keep changing like that.'* (P28, M, 72, made five medication changes but two changed due to side effects)

### **Self-titration of medication**

*Self-titration in practice.* Eighteen patients should have made at least one medication change according to study protocol but not all changes were implemented. Seventeen of these patients made a medication change and one chose not to make any changes. In addition, one patient, who did not need to make any medication changes, increased her medication inappropriately after three low ('red') readings in 1 week, instead of contacting her GP (she was subsequently contacted by the study team and the increase was reversed). The overall pattern of medication changes was complex, due to factors such as side effects, blood test results, high readings, and protocol violations by both patients and GPs.

*Self-titration transfers control towards the patient.* Patients revealed a wide range of views about adjusting their own medication. They liked having greater control and more involvement in their own care. However, by the end of the trial some patients had

forgotten the procedures for implementing changes. This applied particularly to those who had not needed to change their medication:

*'I was quite excited about it, that I'd a bit of control I suppose, a bit of a say in things, because, I mean, you discuss things with your doctor at the beginning and I mean it was a two-way thing really. Yeah I felt good really.'* (P16, F, 49, made two medication changes, chose not to implement medication change 3)

*'I was pleased about that. Well, because of the control business, isn't it? Particularly having now realised how variable one's blood pressure is, it's very haphazard having medication prescribed on the basis of a visit to the surgery.'* (P29, F, 78, made medication change 1, chose not to implement medication change 2)

*'... and I just can't see how it can work. I think the doctor has to do that, not me.'* (P2, F, 60, no medication changes needed)

Several patients pointed out that, they were not actually changing their own medication, as they were following medication plans predetermined by their doctor. Patient 26 felt very comfortable about self-monitoring and titrating, as this was much the same as her husband with diabetes did with glucose monitoring:

*'Well no you don't do your own medication, the doctor gives you an alternative medication ... Yeah it was a good idea, because if you're sensible enough, if you have any reaction to it, you'd take appropriate action ...'* (Partner of P6, F, 69, made three medication changes but stopped two medications due to side effects)

*'I mean, it isn't as though I'm taking an initiative in deciding what to take and what extra to take. It's only... it's still basically up to the doctor, isn't it ...'* (P20, M, 73, made four medication changes)

*Greater control means patients can make their own choices.* Patients were pleased when readings were below target ('green') and sometimes frustrated when readings were borderline (just in 'amber'), as this could trigger a medication change:

*'... if I am in the amber on the first reading, I just completely sit there taking deep breaths and closing my eyes and I'm really determined I'm going to get this down into*

*the green.* (P2, F, 60, no medication changes needed)

Patients were generally confident about implementing a medication change when their blood pressure was consistently above target levels. However, eight of the 17 patients who had implemented an initial medication change chose not to implement a subsequent change, mostly when their readings were borderline raised. Patients thought carefully before deciding not to implement a medication change, and noted that a small change in a single reading could make the difference between a borderline and well-controlled month. Three patients had readings below target in the month after choosing not to increase their medication:

*'There was a couple of times, where it was borderline and the once I did say I didn't want to change ... and I thought well I'd like to see how it pans out before changing.'* (P16, F, 49, medication change 3 not implemented, subsequent readings 'green')

*'I preferred to be slightly higher than suffering all these effects that I'd had, you know, prior to it. Because when you're sort of a sociable person, you don't want to go out and you don't go out. It's a bit, I don't know, it was debilitating really.'* (P24, F, 71, made medication change 1, chose not to implement further medication changes due to side effects)

Patient 17 felt a fourth change might not be necessary and did not agree with his GP's recommendation to increase his medication according to protocol rather than wait to see if his blood pressure remained raised. Patient 3 disagreed with the coding algorithm, as he considered it too rigid because it was possible to have to make a medication change based on two consecutive borderline above-target ('amber') months.

*'I would have probably have left it at least another month, probably a couple of months to see whether it had continued to rise.'* (P17, M, 77, made three medication changes, saw GP before making fourth change)

*'The medication changes I think are too black and white, there's no grey area. I had 1 week, 1 week of testing where I had four amber and three green ... but two of those amber ones was only one unit above the base line and it meant a medication change ... now I think one unit is too close to call for a medication change.'* (P3, M, 55, made

medication change 1, delayed implementation of medication change 2)

*Additional support needed for some patients.* Although patients received training on making medication changes without seeing a GP, several chose to reconsult before implementing such changes. This was usually because they lacked confidence, or because of problems with their medication-change forms. Family members of patients who needed assistance with the trial were more cautious about implementing changes, and relatives of patients 25 and 30 accompanied the patient to visit the GP before making changes:

*'... the instructions were straightforward. Having said that, each medication change we actually made an appointment to see the doctor ... if it had been me, right, so I'd been taking the readings for myself, then I probably would have been quite satisfied to put a sticker on the repeat prescription and send that in; because it was Mum, I was a little bit more ... wasn't quite as comfortable doing it ... . With Mum, with her age, with all her other medications, I was just happier taking her down to the surgery and sometimes she was due to see the doctor again anyway.'* (son of P30, F, 84, made three medication changes)

*'Well I would go to the doctor and he would have a look and see what I was on about, ... I'll take the book and everything, and if he thought it was up then he would do something about it. I wouldn't go on my own and say I want it changed.'* (P13, F, 80, no medication changes needed)

### **Continuing self-management outside of trial conditions**

*Continuing to self-monitor.* Of the patients who self-monitored before the trial, only one monitored their blood pressure daily and had done so for many years, whereas the majority said they had used their monitor only occasionally. After the trial, all the patients were positive about self-monitoring and many wanted to continue. Patients whose blood pressure had been normal throughout the trial were less interested in continuing:

*'I think I am more in favour of doing it myself now, I mean I was a bit nervous at first I suppose, when I first started on the study but now I feel better doing it myself.'* (P16, F, 49, made two medication changes, chose not to implement medication change 3)  
*'I'd be much more inclined now to get one*

for home use ... having done this for 12 months and understanding the readings, I would be less worried, concerned about doing it and quite happy interpreting the results ...' (son of P30, F, 84, made three medication changes)

**Continuing to self-manage.** Few patients wanted to continue to self-titrate their medication, generally because their blood pressure had become normal during the trial. Patients planned to self-monitor occasionally, but more intensively if a reading was raised. Patients expressed confidence in knowing when they should contact the GP for advice.

*'I know exactly what the pressure should be and if they are high then I'd be up the surgery, no problem. But I know what it is, I know what it's all about. I know what the pressure should be, low or high, and you'd go up there to see a doctor ... . No problem, if it saves time then doing it at home and organising your medication then all for it. It saves wasting their time and yours and it's a good thing yeah.'* (P15, M, 70, made five medication changes)

*'I'd go along with the readings and say "look I've just done this for a week and I'm not happy about it". But I think it does seem to me that the essence of this is that you don't bother your doctor, so if it stays ok you don't send them on to him ...'* (P9, M, 64, no medication changes needed)

Patients were also starting to consider what to do in the future. Patient 9 was going to talk to his GP to agree a sensible way to self-monitor and how the GP would want to interact with him. Patient 17 had agreed with his GP to send blood pressure readings every 8 weeks with his repeat prescription request, to allow these to be entered in the notes:

*'In fact we have got it set up with the GP that when I put a prescription request in ... he said "in the week before you put the request in take your blood pressure each day, just note them on there" he said "and I can record them and we can see where we are going".'* (P17, M, 77, made four medication changes)

## DISCUSSION

### Summary

This interview study of participants in a trial of self-management of hypertension found that the intervention was acceptable, improved patients' knowledge of their own

blood pressure, and gave them confidence in taking control of their own care. However, there was divergence of opinion regarding self-titration, with some patients relishing the opportunity to manipulate their own treatment and others requiring continued medical input in making prearranged medication changes. Few participants wished to continue self-management after the trial, which reflects partly the level of blood pressure control gained following the intervention but also suggests that a different approach may be required for self-management after initial titration below target.

### Strengths and limitations

This study provides unique data regarding patients' views on self-titrating antihypertensive medication and supports the results of the TASMINGH2 trial.<sup>7</sup> However, participants in the trial may have different views from others with hypertension in primary care. Only a minority of those invited to take part were randomised, and self-management will not be appropriate for all patients.<sup>7</sup> Further work is required to widen the generalisability of the findings to routine care.

A strength of the study is its ability to provide insights into patients' views in the light of carefully measured trial endpoints, for instance where patients' accounts of decisions about adjusting medication have been cross-indexed with trial data regarding their actual medication titration behaviour. Knowing that an intervention works, particularly where it is complex in nature, is not enough, and such qualitative data provide important information for the implementation of self-management.

The perspectives of the researchers in qualitative work are particularly important.<sup>12</sup> To ensure a wide range of perspectives could emerge, interviews and analyses were undertaken within a large multidisciplinary research team. The research team included clinicians, non-clinicians, those who were closely involved in day-to-day trial management, and those who were not. As such, they may have taken a different emphasis from that of an independent observer. However, this possible disadvantage is balanced by the knowledge of the trial, which allowed interviewers to understand detailed issues with trial procedures.

Most of the interviews took place when patients had completed the trial, to maximise experience of self-titration; however, this meant that some patients could not accurately recall details from the early

months of the study. Conducting additional interviews at earlier stages of the trial when many medication changes took place may have provided additional information. The greater reduction in blood pressure of the patients interviewed compared to patients in the trial as a whole reflects the purposive sampling used to focus on patients who had made medication changes.

#### Comparison with existing literature

The experience of taking part in the trial changed awareness of blood pressure and gave specific knowledge of treatment targets. Participants developed a 'feel' for what was their usual blood pressure and how it varied, as has been described in another study of self-monitoring.<sup>8</sup> Blood pressure variability has recently been highlighted as a particular issue in stroke prevention, and self-monitoring provides a novel opportunity for recognition of this.<sup>13</sup>

Although adherence was not formally measured in these results, participants reported high levels of adherence, which may not have been affected by the trial.<sup>14</sup> As with other studies of antihypertensive medication, there was a general reluctance to take such drugs, tempered by acceptance of the need to reduce risk.<sup>15</sup>

Almost all the patients reported positive views on self-monitoring of blood pressure. In terms of self-titration, most patients interviewed successfully implemented a medication change, but several were reluctant to increase medication further in the face of borderline readings, a form of participant inertia.<sup>16,17</sup> This suggests that self-management may not overcome the key physician-based barrier to blood pressure control, namely clinical inertia.

The lack of enthusiasm for continued self-management outside of the trial contrasts with that seen in anticoagulation.<sup>18</sup> This reticence of people with hypertension for ongoing self-management may reflect the lower impact of usual care on lifestyle compared to anticoagulation.

There was no evidence that patients became preoccupied with monitoring their blood pressure when they self-monitored, despite this being suggested as a potential disadvantage of home monitoring, particularly by health professionals.<sup>19,20</sup> The main trial results concurred, showing no increase in anxiety.<sup>7</sup> This may reflect patients' improved understanding and confidence in interpreting their readings. Interestingly, the Diabetes Glycaemic Education and Monitoring (DiGEM) trial of blood glucose monitoring found that patients who self-monitored intensively

were less concerned about becoming obsessed than those who monitored less intensively or not at all.<sup>21</sup>

#### Implications for practice and research

Some patients required significant input from their GPs, despite having been trained and equipped for self-management, which has implications for the further development of the self-management intervention. This appeared to be more of an issue where a relative or carer was involved in an individual's care. Understanding the additional support that such participants need will be important in the wider implementation of self-management. Options for such support could include the addition of web-based, nurse, or pharmacist support and the latter has been shown to be successful in a recent US trial.<sup>22</sup>

Self-management could fit well within a multistep process for monitoring in chronic disease, where monitoring intensity varies between pretreatment, initial titration of medication, and longer-term follow-up once the target is achieved.<sup>23</sup> Patients in this study appeared to understand this concept in the way they approached self-monitoring, but perhaps a more flexible model is needed for the longer term, with periodic monitoring only reverting to self-titration where control is lost. Further work is required to elucidate the training needs and practicalities of such an approach. It should also not be forgotten that raised blood pressure is just one of many vascular risk factors that patients and doctors need to address. The positive way in which people regarded self-monitoring, coupled with the evidence that self-monitoring alone has an effect on blood pressure,<sup>5</sup> suggests that greater use could be made of this approach by healthcare professionals in the long-term monitoring of people with hypertension. Indeed, if the focus in the future turns more towards identifying variability in blood pressure as opposed to simply identifying raised blood pressure,<sup>24</sup> then self-monitoring may be an attractive option.

Self-management impacts on patients, their interactions with clinicians, and the current professional-led system of hypertension care. It has been shown to be effective in improving blood pressure control by breaking down some of the barriers inherent in usual care. Maximising this benefit requires careful integration of this novel method into daily practice, with particular attention to providing a supportive environment for self-management without losing sight of patients' preferences.

#### Funding

This study was funded by the Department of Health Policy Research Programme. The funders had no role in the study design, in the collection, analysis, and interpretation of the data, or in the writing of the paper. Richard J McManus is funded by an NIHR Career Development Fellowship.

#### Ethical approval

This study was approved by Sandwell and West Birmingham Local Research Ethics Committee (07/Q2709/42), and informed consent was given by all participants.

#### Provenance

Freely submitted; externally peer reviewed.

#### Competing interests

Richard J McManus received a consultancy fee from Tplus Medical (in 2006) to advise on telemonitoring services. FD Richard Hobbs has received limited research support in terms of blood pressure devices from Microlife and BpTRU. All other authors have no conflicts to declare.

#### Acknowledgements

We would like to thank the patients and their families who participated in this study.

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