Using telehealth in the management of hypertension


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Abstract
Telehealth is a recent concept in hypertension management, and involves using electronic technology to monitor patients’ vital signs, such as blood pressure, in their homes. This article presents the findings of a literature review that explored the issues associated with implementing telehealth in the primary care setting. It outlines the challenges associated with telehealth, as well as the potential benefits in terms of improving hypertension management.

Aim To explore the usefulness of, and evidence for, telehealth in the management of hypertension in the primary care setting.

Method The population, intervention, comparison and outcome (PICO) tool was used to define the research question for the literature review, which was: ‘Do adults with hypertension being monitored with telehealth/telemonitoring have a higher quality of life and improved management compared with standard care?’

Findings The literature review identified that a common challenge in implementing telehealth in patients with hypertension was the requirement to improve patients’ compliance with and participation in telehealth systems.

Conclusion Ongoing challenges with the implementation of telehealth include suboptimal feedback, and reduced patient interest in and compliance with telehealth systems. It was also noted that patients involved in longer trials had a higher withdrawal rate than those enrolled on shorter intense studies. In addition, patient lifestyle choices, including outdoor working, and lack of Wi-Fi proved a challenge to self-monitoring. If not resolved, such challenges could adversely affect the widespread use of telehealth.

Keywords
blood pressure, hypertension, literature review, primary care, research, self-care, telehealth, telemonitoring

Hypertension is defined as blood pressure of 140/90mmHg or higher (Dougherty and Lister 2015), and is a preventable cause of premature morbidity and mortality (National Institute for Health and Care Excellence (NICE) 2017). Hypertension is an increasing challenge for the NHS, costing in excess of £2 billion each year and accounting for 12% of all GP visits (Public Health England 2014, Dougherty and Lister 2015). Using primary care-based healthcare services to diagnose and treat hypertension could save more than £120 million per year if only 15% of cases were diagnosed (Public Health England 2014).
with and age-related challenges in using electronic equipment and the amount of technological involvement required, mean that not everyone is able to benefit from this service (Abdullah et al 2016).

**Aim**
To explore the usefulness of, and evidence for, telehealth in the management of hypertension in the primary care setting.

**Method**
The population, intervention, comparison and outcome (PICO) tool was used to define the literature search question (Box 1) (Ellis 2010). PICO is designed to assist researchers in formulating a research question in terms of a specific patient challenge, and enables the researcher to locate clinically relevant evidence from the literature. The research question was: ‘Do adults with hypertension being monitored with telehealth/telemonitoring have a higher quality of life and improved management compared with standard care?’

The following databases were accessed: AMED (The Allied and Complementary Medicine Database); EBSCO; CINAHL (Cumulative Index to Nursing and Allied Health Literature); PubMed Central and Medline; Joanna Briggs Institute; Cochrane Library; Internurse; Web of Science; and Google Scholar. The Boolean terms ‘AND’ and ‘OR’ were used to ensure accurate searches, and search terms included ‘hypertension’, ‘community’, ‘primary’, ‘telehealth’, ‘telemedicine’ and ‘telemonitoring’. The date range for publication was 2010-2016. In addition, books, articles, websites and guidelines were also searched. From the literature search, 480 articles were identified, which were assessed using the inclusion and exclusion criteria in Table 1.

Fourteen articles were identified, which were read by the researchers to assess which were the most appropriate and recent. Six articles were considered appropriate (McManus et al 2010, McKinstry et al 2013, Kaambwa et al 2014, Cottrell et al 2015, Glynn et al 2015, Abdullah et al 2016). Four themes emerged from the analysis of these articles, including:

- Cost.
- Patient participation with telehealth systems.
- Effectiveness of hypertension monitoring using telehealth.
- Involvement of healthcare professionals.

**Findings**

**Cost**
Management of hypertension is one of the most common healthcare-related interventions in primary care. In 2006, it accounted for approximately £1 billion in medicine costs alone (NICE 2016). McManus et al (2010) undertook the telemonitoring and self-management in the control of hypertension (TASMINH2) trial, which investigated whether self-management by patients with suboptimal control of hypertension using self-monitoring of blood pressure and self-titration of anti-hypertensive drugs, combined with telemonitoring of home blood pressure measurements, resulted in improved blood pressure control compared with standard care. The findings demonstrated that self-management represented an important new method for controlling hypertension in primary care.

Kaambwa et al (2014) undertook a cost-effectiveness analysis of the TASMINH2 trial, and found that self-monitoring and self-medication was cost-effective in comparison with standard hypertension care, which included either management by the patient’s GP, with nurse and pharmacy involvement, or self-management. Kaambwa et al (2014) also found that if cardiovascular events are reduced with self-management, telehealth could
become more cost-effective than standard care over a longer period. However, Kaambwa et al. (2014) assumed that quality of life improvements, and therefore blood pressure reduction, would continue for at least two years following the trial, which is unsubstantiated and not evidenced in the literature.

McKinstry et al. (2013) and Kaambwa et al. (2014) concurred that lowering patients’ blood pressure could potentially save money because it could reduce future cardiac events caused by hypertension. However, both studies measured costs in different ways, thereby making direct comparisons impossible. Both the McManus et al. (2010) and McKinstry et al. (2013) studies received substantial funding from various sources, including NHS Scotland and the DH. This could lead to potential bias because of a possible vested interest in reducing healthcare costs as well as improving patient outcomes (Bero 2013).

Abdullah et al. (2016) suggested that self-monitoring of hypertension had a positive effect on people’s blood pressure, but that it was more expensive than standard care. However, Abdullah et al.’s (2016) data were not obtained from their research, but from a meta-analysis of randomised controlled trials (Omboni et al. 2013). Abdullah et al. (2016) also found that some patients were concerned about the cost of the equipment involved in a blood pressure telemonitoring service, particularly about having to pay to replace any damaged equipment.

This anxiety had the potential to cause false readings as well as preventing patients from recommending the equipment to others, which in turn could prevent the benefits of telehealth being promoted locally (Abdullah et al. 2016). There were also concerns among GPs about the initial cost of equipment for self-management and the effect of this on its availability in primary care (Abdullah et al. 2016).

Cottrell et al. (2015) developed the Florence programme, which consisted of a simple telehealth intervention to assist in diagnosing and monitoring blood pressure via text messages and telemonitoring equipment. Part of the Florence programme was privately sponsored, which led to 15,000 texts being paid for by a media company and any further texts being paid for by the relevant clinical commissioning group (Chambers et al. 2013). This meant that neither the patient nor the healthcare professional had to pay for text messages, which was a potential benefit, since the World Health Organization (2003) found that free services and adequate support might increase patients’ compliance with such services.

**TABLE I. Inclusion and exclusion criteria**

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
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<tbody>
<tr>
<td>Adults aged 18 years or over</td>
<td>Patients aged under 18 years</td>
</tr>
<tr>
<td>Published since 2010</td>
<td>Published before 2010</td>
</tr>
<tr>
<td>Text available in English</td>
<td>Text unavailable in English</td>
</tr>
<tr>
<td>Telehealth or telemonitoring</td>
<td>Clinical or hospital monitoring</td>
</tr>
<tr>
<td>Randomised controlled trials, qualitative studies, service evaluations</td>
<td>Case studies, review articles, realist reviews (those designed for complex social interventions and programmes) (Pawson et al. 2005), unfinished studies or ongoing systematic reviews</td>
</tr>
<tr>
<td>Formerly diagnosed hypertension</td>
<td>Undiagnosed hypertension</td>
</tr>
<tr>
<td>Based in community or primary care</td>
<td>Based in hospital or secondary care</td>
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**Patient participation with telehealth systems**

Not all patients have the same levels of proficiency in using telehealth systems. For example, Abdullah et al. (2016) found that older patients found it challenging to use the telehealth equipment and had to rely on younger family members to assist them. Another issue that has been identified by service users and healthcare professionals is the availability of Wi-Fi (Cook 2012, The Queen’s Nursing Institute 2013). Abdullah et al. (2016) found that patients had concerns about leaving their homes because of a lack of Wi-Fi in certain areas, while others worked outside and were unable to send blood pressure recordings when required.
Patients were initially interested in promoting their own health, however, this decreased over time. They found it challenging to lead normal lives because they were unable to use the equipment without a family member present or were anxious about being unable to work while using the equipment; this was more prevalent in those who worked outdoors (Abdullah et al 2016).

Glynn et al’s (2015) study recruited participants with high, medium and low levels of computer literacy to ensure impartial results. The study outlined that during certain times of the year, for example Christmas or holidays, patients tended to disengage from the use of technology-based self-management tools, a factor that could also contribute to the finding in the McManus et al (2010) TASMINH2 trial that 12% of participants eventually stopped monitoring their blood pressure.

In Cottrell et al’s (2015) trial of the Florence programme, patients used a mobile telephone to communicate their blood pressure results to healthcare professionals via text message. However, this excluded patients who were not competent in using the technology, narrowing the choice of participants. Cottrell et al (2015) also found that patients did not always adhere to the self-monitoring programme; however, this was often because of responses from healthcare professionals not being received quickly enough, or conflicting advice being provided by healthcare professionals, including GPs and pharmacists.

Effectiveness of hypertension monitoring using telehealth

Participants in McKinstry et al’s (2013) study were generally positive about the use of telehealth; however, some became anxious about taking on the responsibility for managing their health and using the equipment. This reflected Abdullah et al’s (2016) finding that patients could be nervous about using the telehealth systems incorrectly or breaking them, which in turn could have a negative effect on the accuracy of the readings. In contrast, Cottrell et al’s (2015) study found that patients were confident in self-monitoring; however, this represented only 54% of participants because of a high level of withdrawals and a lack of communication between patients and healthcare professionals.

In McManus et al’s (2010) study, 71% of the intervention group preferred self-monitoring to standard hypertension care, although patients also found the technology ‘annoying’ at times, or found it hard to remain motivated. Abdullah et al (2016) also found that patients became aggravated by having to constantly engage with telehealth systems and therefore lost interest in their use. According to Glynn et al (2015), the main issue was the structuring of telehealth systems around patients’ requirements, for example enabling them to access monitoring systems on their mobile phones, to motivate them and prevent disengagement. Structuring telehealth systems to match patients’ skill levels also promotes person-centred care (McCance et al 2013, Care Quality Commission 2017).

Involvement of healthcare professionals

Levels of compliance decreased when healthcare professionals did not provide timely or adequate responses to patients’ blood pressure readings. For example, in Abdullah et al’s (2016) study, patients became confused by a lack of communication, particularly where doctors failed to contact them if their blood pressure readings were within normal ranges, leading patients to become unsure whether they were healthy, their medication was correct, or they had to act on the readings. While telehealth involves patients monitoring their health and wellbeing, some of the patients in Abdullah et al’s (2016) study were not aware of normal blood pressure ranges, meaning that they became concerned by a lack of communication.

Many healthcare professionals found that although patient visits decreased during the trials, the input required from healthcare professionals increased, for
example initial training and support was required for healthcare professionals in accurate telehealth readings and medication titration. Healthcare professionals involved in Abdullah et al’s (2016) trial were provided with one day’s training on the telehealth systems; similarly, McKinstry et al’s (2013) study involved healthcare professionals undertaking training before implementation. McManus et al’s (2010) study partly bypassed healthcare professionals, with results being sent directly to the researchers; for example, an appointment with a GP for titration of medication was only necessary following two concurrent high or low results. This avoided some of the time taken up by appointments, however, it still required GPs to inspect and amend patients’ medication.

Cottrell et al (2015) outlined how the DH has funded incentives to encourage the use of digital healthcare in general practice. Workshops were provided for qualifying clinical commissioning groups where the Florence programme was demonstrated to healthcare professionals before its implementation. However, it was inconclusive whether the Florence programme benefited healthcare professionals or reduced patient visits to GP surgeries and clinics.

Discussion
In the studies included in this literature review, the cost of hypertension management using telehealth systems varies because of incorrect results or study bias. While the cost might initially be high because of equipment and training expenses, over a period of five years the costs saved through effective management of hypertension outweighs the initial expenditure (Kaambwa et al 2014). However, this view is unsubstantiated because of a high withdrawal rate evidenced in longer-term studies (Cottrell et al 2015). The reasons for these withdrawal rates are not clear, although it could be suggested they result from patients losing interest in the technology and becoming distracted by everyday life (Abdullah et al 2016). This demonstrates that although telehealth might be cost-effective over a long period, this may be negated by reduced compliance rates and the lack of healthcare professionals willing to implement such an expensive method of managing hypertension.

The literature review demonstrated that many healthcare professionals initially agreed that introducing telehealth systems might reduce patient visits and the cost and time spent on hypertension management. However, initial training and technology systems are required for an effective service and some GP services could not afford to provide telehealth systems in the long term. Similarly, over time many patients became non-compliant with telehealth systems and reverted to standard care, while throughout the studies healthcare professionals had to devote time to titrate medications and advise on abnormal readings. These factors counteracted the initial benefits of telehealth systems in reducing the time spent managing hypertension.

Patients who participated in both the Cottrell et al (2015) and the Glynn et al (2015) studies found telehealth convenient because it was linked to mobile devices. This is in direct contrast to other studies, such as Abdullah et al (2016), where more complicated monitoring systems were found to be a hindrance to users. The type of equipment used to provide telehealth may therefore affect patients’ perceptions, with those using cumbersome systems finding telehealth inconvenient.

Conclusion
This literature review identified several ongoing issues with telehealth systems, including suboptimal feedback, failure to deliver results, and reduced patient interest and compliance. It was also noted that patients involved in longer trials had a higher withdrawal rate than those in shorter, more intense studies. In addition, patient lifestyle-related factors, including outdoor working and lack of Wi-Fi, hindered self-monitoring. If such issues are not resolved, they could affect the success of widespread implementation of telehealth.
IMPLICATIONS FOR PRACTICE

» Telehealth is a useful service that can enable patients to monitor their health in their homes using electronic technology. Involving patients in their health may improve self-management of conditions such as hypertension.

» To improve patient participation with telehealth systems in the management of hypertension, it is important to consider education and training in the use of telehealth equipment and communication between patients and healthcare practitioners in relation to blood pressure readings.

» Telehealth systems should be structured around patients’ requirements, for example enabling them to access monitoring systems on their mobile phones, to increase engagement with, and motivation to use, such technology.

References


