

## ORIGINAL ARTICLE

## Telemonitoring for chronic heart failure: the views of patients and healthcare professionals – a qualitative study

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**Aims and objectives.** To understand the views of patients and professionals on the acceptability and perceived usefulness of telemonitoring in the management of chronic heart failure in the context of day-to-day care provision.

**Background.** There is an increasing interest in the potential for telemonitoring to support the home-based management of patients with chronic heart failure. However, little is known about the views of patients and professionals on the use of telemonitoring in this context. A chronic heart failure telemonitoring service was set-up by NHS Lothian, Scotland, to evaluate the intervention.

**Design.** A qualitative design was adopted to explore the views of patients and professionals participating in the service.

**Methods.** Semi-structured interviews were undertaken with 18 patients (61% male, mean age 75 years) and five professionals participating at different time points in this new service. Interviews were audio recorded, coded and thematically analysed using the Framework approach.

**Results.** Five main themes were identified: 'information, support and reassurance'; 'compliance and dependence'; 'changes and challenges'; 'determining the criteria for patient applicability to telemonitoring'; and 'continuity of care'.

**Conclusion.** Patients and professionals considered telemonitoring useful in the management of chronic heart failure, although with some caveats. Telemonitoring was popular with patients because they felt reassurance arising from what was perceived as continuous practitioner surveillance. Professionals expressed concern regarding perceived patient dependence on practitioner support. Increased workload was also a concern. Both groups acknowledged the need for improved technology and changes to service provision in order to better meet the intended objectives of the service.

**Relevance to clinical practice.** Although popular with patients, professionals emphasised the importance of case selection and adequate training and support, both for patients and themselves, in order to maximise the expected benefits of the service, particularly with regard to enabling self-management.

**Key words:** heart failure, primary care, qualitative research, telehealth

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## Introduction

Chronic heart failure (CHF) is a major public health problem. Approximately 2% of all adults in developed countries have CHF (Cowie *et al.* 1997). It is the leading cause of hospitalisation in people older than 65 (Krumholz *et al.* 2000). Frequent readmission to hospital is common, particularly with elderly patients (Michalsen *et al.* 1998). The provision of services to patients with CHF cost the UK National Health Service an estimated £625 million each year (NHS Institute for Innovation & Improvement 2007) and \$35 billion in the United States (Rosamond *et al.* 2008). Although it is well established that specialist heart failure nurses can help patients reduce their hospital admissions (Blue *et al.* 2001), as patient numbers increase and the cost of healthcare provision continues to rise, concern is growing over the future sustainability of current, clinician-centred models of care management (Wanless 2002).

There is increasing interest in the potential for telehealth to support the home-based management of patients with long-term conditions as a means of providing a more patient-centred, cost-efficient and 'joined-up' service (Department of Health 2012). However, the evidence based on the utility of telehealth systems to support the management of CHF is inconclusive (Anker *et al.* 2012). Studies indicating that telehealth has a positive effect on clinical outcomes (Clark *et al.* 2007, Maric *et al.* 2009) have been challenged by the findings of later studies (Chaudhry *et al.* 2010, Koehler *et al.* 2011). Most recently, preliminary pooled data from the Whole Systems Demonstrator project, the world's largest telehealth trial involving patients with several conditions including CHF, shows a marginal benefit although the specific CHF findings are still awaited (Stevenson *et al.* 2012).

In tandem with the debate on efficacy, the importance of contextual factors considered to affect the implementation of telemetric interventions (and thereby impact on their degree of success), such as the type of technology, the patient's condition and the design of services, has become increasingly recognised (Godlee 2012). Whilst recent research has indicated the applicability of telehealth in enabling and supporting self-care (Finkelstein & Wood 2011, Radhakrishnan & Jacelon 2012) little is known about what patients with CHF and their professionals actually think about telehealth systems; their views on the technology and the service arrangements, whether they think telemonitoring affects care and practice, and what they think is good and bad about it. Understanding how people relate to the introduction of such services not only contributes to identifying the factors that underpin the success or failure of individual initiatives, but

enables greater understanding of the factors involved in the normalisation of innovative clinical interventions into mainstream practice (May *et al.* 2003). The introduction of a telemonitoring service for patients with CHF in Lothian, Scotland, in 2009, presented the opportunity to undertake research in this area.

## Aims

The aim of the research study was to understand the views of patients and professionals on the acceptability and perceived usefulness of telemonitoring in CHF in the context of day-to-day care provision.

## Research design

A qualitative design was adopted. Semi-structured interviews were undertaken to explore the views of patients and professionals involved with the CHF telemonitoring service in Lothian, Scotland.

## Ethical considerations

Ethical approval was granted by the Lothian Research Ethics Committee (ref 08/S1101/34). Informed consent was obtained by provision of an invitation letter with accompanying information sheet and consent form. Participants were assured that their interviews would remain confidential and be reported anonymously. All participants were aware that they could stop the interview and withdraw from the study at any time.

## Sample

The patient sample comprised two parts: patients who were telemonitored by the GP and those telemonitored by the CHF nurse service. Patients from both groups were invited to interview in order to acquire views relating to telemonitoring as undertaken by the GP or by the nurse service. In both cases, telemonitoring professionals provided the contact details of patients who had verbally consented to be contacted by the research team. The GP responsible for telemonitoring provided a list of 22 patients, actively involved in telemonitoring when the research project started. The contact details of a further six patients were provided by the CHF nurses. All were approached. Postal invitations to interview were issued to all patients. Reminder letters were sent to non-respondents one month after the dispatch of the first invitation. Written consent was taken prior to interview. Some patient participants requested that their partner/family member be present and contribute to the interview. Interview dyads were undertaken in those circumstances (four cases).

## Box 1 NHS Lothian CHF telemonitoring service

In 2009, NHS Lothian, Scotland, set-up a CHF telemonitoring\* service.

The purpose of the service was threefold, namely to: (i) reduce hospital admissions resulting from unmanaged exacerbations; (ii) improve quality of life for patients; and (iii) foster increased patient self-management.

The telemonitoring service involved use of a device called the Intel<sup>®</sup> Health Guide (IHG) (Intel<sup>®</sup>, 2012). This device enabled patients to undertake a daily self-assessment of symptoms using an online, touch screen questionnaire. A number of peripheral devices were linked to the IHG using Bluetooth<sup>®</sup> technology to enable patients to undertake physiological measurements. These were: a pulse oximeter to measure pulse rate and oxygen saturation; an electronic sphygmomanometer for blood pressure; and electronic weighing scales. Patients were instructed to take readings using these devices on a daily basis. The IHG also contained educational content (in the form of online video-based content) to support patient self-management. An additional telephone line was installed in the homes of patients participating in the trial to provide broadband internet for the use of the equipment.

Initially, telemonitoring in Lothian was undertaken by one GP with an interest in eHealth who managed a caseload of up to 42 patients. However, in summer 2010, the service arrangement changed. Specialist CHF nurses commenced weekday telemonitoring for the patients in their care and at weekends telemonitoring was carried out by the Lothian Unscheduled Care Service. Telemonitoring responsibilities for professionals involved daily monitoring of data and initiation of contact with patients to address any matters arising related to transmitted data. Telemonitoring data were accessed by professionals via a secure website. An algorithm was used to process data, and a score was attributed to symptoms and physiological measures, which breached preset target levels. High scores were flagged up for clinicians who then contacted the patient.

Patients were encouraged to contact telemonitoring professionals to discuss any concerns or to acquire advice related to telemonitoring and/or their condition. Patients continued to have access to usual care provision during their period of involvement with the telemonitoring service. The service was supported by the health board's E-Health Department, which provided a technical help desk facility to patients and professionals involved with the service.

\*In this context, telemonitoring refers to the use of communication technology to enable healthcare professionals to remotely monitor patients' clinical status.

Respondents who were telemonitored by the GP were interviewed during the first months of 2010 and respondents telemonitored by the nurse-led service were interviewed autumn–winter 2010/2011. The majority of those interviewed had been telemonitoring for three months or more and had gained familiarity with the technology.

Healthcare professionals involved in the telemonitoring service were interviewed. This comprised the GP who had initial responsibility for telemonitoring, three (out of the team of four) CHF nurses involved in telemonitoring, and an associated information technology professional who supported the service. Healthcare professionals were interviewed either in the workplace or by telephone.

### *Interview guides*

Interview guides were used to structure discussion. Patients and professionals were asked to describe their experience of telemonitoring, its impact on care and treatment/clinical practice, to outline things they liked or did not like about it and to identify any benefits and/or risks. Interview guides were reviewed and

refined iteratively during the process of data collection and analysis (interview guides are presented in Appendix 1).

### **Data collection**

Patient interviews occurred face-to-face within the person's home, or by telephone. The average interview duration was 30 minutes. Interviews were conducted by two postgraduate-trained social researchers (one male, one female). The positioning of the researchers as non-clinical investigators operating at 'arm's length' to general practice and the telemonitoring intervention helped facilitate open discussion (preventing any perceptions of vested interest related to the technology, its suppliers or to practitioners engaged in providing the service). One of the researchers had a background in health service project management in eHealth initiatives and whilst this was considered beneficial in understanding the research arena, care was taken not to let this perspective unduly influence data collection and analysis (data collection and analysis was closely supervised

**Table 1** Data analysis – development of categories and themes

Initial themes	Initial categories	Refined categories	Refined themes	Core concept
Living with chronic heart failure	Diagnosis	The importance of information provision	Information, support and reassurance	Managing change
Setting up service	Installation Training and initial information provision	Feeling ‘watched over’ and ‘looked after’ (patients)	Compliance and dependence	
Using technology	General usability Usage and problems: Intel® Health Guide Sphygmomanometer Pulse oximeter Scales	The routine usage of the technology and problems with the technology The challenges of self-management Medication issues	Changes and challenges Determining the criteria for patient applicability to telemonitoring Continuity of care	
Receiving telemonitoring service (patients)	Expectations Views of the service Addressing changes to medication resulting from telemonitoring Interaction with family and carers Cost issues Withdrawal from service	Patients’ dependence on telemonitoring professionals Workload issues (professionals) Training and support issues (professionals) ‘Closer monitoring’ – the patient–practitioner relationship during telemonitoring		
Self-management	The daily routine Taking readings Reacting to readings			
Undertaking telemonitoring (professionals)	Expectations Training Criteria for patient applicability to telemonitoring Perceived impact on job role and function Perceived impact on patient–practitioner relationship Perceived impact on workload Perceived benefits of telemonitoring Perceived negatives of telemonitoring Measuring ‘success’ Service management Models of future service delivery			

within the research team). The researchers had no prior contact with patients involved in this study before invitation to interview. All interviews were audio recorded. Interviews were transcribed verbatim. Transcriptions were checked against the audio recordings. All participants were given the option to receive a copy of their transcribed interview for comment and correction. Field notes were written after each interview to support analysis. As data collection progressed, the emergence and recurrence of key themes became prominent. The frequent recurrence of key themes identified during data collection and analysis indicated data saturation at 18 patients.

### Data analysis

The research team analysed the data using the Framework approach (Ritchie & Lewis 2003). This method was chosen for three reasons. First, it was initially designed to facilitate qualitative data analysis in applied research. Second, it provided a robust framework for data management. Third, the method supports the reader to critically appraise the study’s findings by outlining the steps taken in the interpretation and analysis of the data.

Analysis of the data followed the three interconnected stages of the Framework approach (Ritchie & Lewis 2003):

Table 2 Demographic characteristics of patient respondents

Characteristic	Respondents ( <i>n</i> = 18)
Sex	
Female	7
Male	11
Age (in years)	
Below 64	3
65–74	4
75 and above	11
(Youngest = 50, oldest = 80, mean = 74)	
Scottish index of multiple deprivation (%)	
0–20	3
21–100	15
Service model	
GP-led telemonitoring	15
Nurse-led telemonitoring	3

(1) data management; (2) descriptive accounts; and (3) explanatory accounts. The two researchers who had undertaken the interviews immersed themselves in the data, reading and rereading the transcripts in order to identify initial categories and themes. Initial thoughts and analysis were presented by the two researchers at weekly meetings to the wider research team to support an understanding of the data. The first author undertook data coding using NVIVO 7 software (QSR International Pty Ltd, Doncaster, Victoria, Australia). An initial coding frame and a composite report of coded data were produced and a meeting of the research team was convened to review this work. (The initial coding frame is presented in Appendix 2.) The team sought to refine both the categories and themes based on the identification of important phenomena and associations drawn from the data. The data was then recoded by the first author using NVIVO 7 (QSR International Pty Ltd). A second meeting was held to review the revised coding frame and coded data. At this stage interpretation was supported by feedback from interview respondents. This resulted in the further revision of the coding framework. At all stages constant comparison; checking experiences against those of others in the sample (Thorne 2000), was undertaken to ensure that the analysis represented all perspectives. A summary of the development of categories and themes is presented in Table 1.

## Results

A total of 18 patients (61% male, mean age 75 years) and five healthcare professionals provided 23 interviews (see Table 2). Family members contributed in four of the interviews (either husband or wife). Ten patients did not

respond to invitation to interview. The patient response rate was 64%. Only one healthcare professional involved in telemonitoring did not respond to invitation to interview.

Five main themes were identified using the Framework approach: 'information, support and reassurance'; 'compliance and dependence'; 'changes and challenges'; 'determining the criteria for patient applicability to telemonitoring'; and 'continuity of care'.

### Information, support and reassurance

Telemonitoring was extremely popular with patients. All of the respondents found the technology easy to use. Many stated that they liked being telemonitored because they felt reassurance arising from what was perceived as the provision of continuous practitioner surveillance and support:

It gives the sort of reassurance that Big Brother's watching me and even perhaps they can look after me... (patient #13: male, 61 years)

Patients also expressed the view that they felt better informed and more knowledgeable about their condition as a result of involvement in the telemonitoring. Many found it helpful to know their weight, blood pressure and oxygen saturation score and to have the facility to monitor data trends over time. This was considered beneficial in determining state of health:

It keeps you in the picture... And you know exactly what's going on from day to day... And it also lets [the telemonitoring nurse] know exactly what's going on... (patient #2: male, 75 years)

I felt quite happy to be involved... instead of just being a vegetable that sat back and swallowed things. (patient #24: female, 79 years)

Professionals perceived that telemonitoring facilitated 'closer monitoring' of patients. Telemonitoring data were attributed as providing a more detailed picture of patient health than usual care, enabling the professional to take pro-active approaches to clinical management:

It allows us to look at patients every single day, as opposed to, at the moment, seeing people, maybe every four, six or twelve weeks, dependent on the patient, so you get a much better picture of their daily condition...things get picked up a lot quicker. (Professional #4)

### Compliance and dependence

Many professionals considered that patients' access to telemonitoring data combined with increased accessibility of healthcare professionals operating telemonitoring services increased both the depth and frequency of communication

between patients and professionals. Whilst this was often considered a good thing in terms of supporting early intervention and preventing deterioration in health, professionals also expressed concern regarding perceived greater patient dependence on practitioner support:

...it encourages more of the sick dependency role... I don't think it's something that you would want to continue for years in a stable patient. I think there are patients who benefit from it for a short period of time, but then you hope that they'll check their own weight, be aware of their symptoms, whereas the machine tends to do that for them... (Professional #3)

In contrast, patients did not express the view that telemonitoring increased ownership of the management of their condition. Whilst they perceived that telemonitoring supported existing efforts to monitor weight and blood pressure, they considered that healthcare professionals held primary responsibility for the management of their condition. Many thought the service was designed to increase practitioner support, rather than to foster greater personal responsibility:

I know if there is something wrong, they are going to pick it up right away... if something goes wrong, they'll phone me. [It's a] safety net. (patient #29: male, 79 years)

Practitioner attempts to encourage involvement in self-management (for example, in attempts to encourage patient participation in self-directed medication) received a mixed response, with some expressing anxiety and trepidation at the prospect of being required to exercise greater personal responsibility although, as shown below, there is a suggestion that confidence may grow with longer-term support:

...the doctors kept saying to me that you can self-medicate with fluid tablets. And I would think 'oh no [laugh], I don't know what I'm doing here, so I'm not going to do that...' But then the [tele-monitoring staff] at the other end said take another fluid tablet... And then gradually, I started to realise that when I felt unwell I was able to think 'oh, you know, take another tablet or half a tablet.' (patient #27: female, 50 years)

Professionals queried the utility of the telemonitoring technology in supporting patient self-management. One respondent remarked that the IHG questionnaire was devoid of questions or prompts to encourage and support self-management attitudes or behaviours. Both patients and professionals commented on the limitations of the technology to support patient-practitioner dialogue insofar as it provided no means for online interaction further to receipt of patient data (subsequent follow-up communications were made by telephone or in person).

I think the technology is geared to be a little bit more controlling... sending people messages and telling them to do things at a particular time, [but] we don't use it like that... (Professional #5)

The importance of formalised education and training in supporting patient self-management was discussed by the professionals. The lack of formalised educational provision to support patient self-management as part of the service was a concern for a number of them. This led some to question whether patients would identify responsibility for self-management during telemonitoring without such support. One professional was puzzled how patients could engage in self-management during telemonitoring given the design and functionality of the technology:

It might be useful if the [telehealth system] would give [patients] prompts like: 'have you taken your medications today?'; 'have you watched how much salt is in your diet?'; 'have you taken any exercise today?' The questions [in the Intel<sup>®</sup> Health Guide] aren't geared for self-management... and that's why I personally don't think it actually encourages them to self-manage... (Professional #2)

## Changes and challenges

Whilst patients and professionals identified perceived and potential benefits arising from telemonitoring, both groups described numerous technical difficulties with the technology. Professionals also discussed the impact of telemonitoring on existing practice.

### *Teething difficulties, concerns and design issues*

Patients and professionals reported experiencing technical problems with the equipment, notably recurrent malfunctions with the peripheral devices. Some commented on the intrusiveness of the equipment, remarking on the noise and luminosity of the IHG and its size or bulkiness in the home. Both groups raised concern regarding the expensiveness of the equipment, the cost consequences of installation (which required the fitting of broadband cabling in patients' homes) and the ongoing costs of support and maintenance:

The question is it is cost effective for the health service? The capital cost of all this is considerable, the cost of the gadgetry is one side of it and the rental fees for the telecoms is another, and all of our time input is of course not costed, it's done for nothing, it's done on the back of the day job. I could be very provocative and say could you achieve the same without the connectivity? Could the patients' phone in, which would save a lot of money in the broadband rental, but then if they had the gadgetry would they phone in with their results? (Professional #1)

Professionals described problems arising from the perceived lack of interoperability between the (stand-alone) telemonitoring patient information system and existing patient information systems used in both primary and secondary care. They indicated frustration with the limited functionality of the telemonitoring system, and the compartmentalisation of data between telemetric and usual care information systems. The perceived lack of systems interoperability was considered to prevent information sharing with colleagues, and this was felt to be a barrier to care provision:

It's not user friendly, it's not intuitive. [Named doctor], for example, is phoning up our patients on a weekend, he doesn't know what tablets that they're on, he doesn't know their past medical history... he can't access any the information because they're patients that are not in his practice. (Professional #2)

#### *Changes and challenges to practice*

Just under half of the patients interviewed (7) in this study spoke of changes to medication resulting from telemonitoring. For some professionals, telemonitoring supported the development of prescribing practice, providing an evidence-base for the trialling of medications on selected patients:

[telemonitoring] has allowed me a greater confidence in patients who I thought would maybe not, for example, tolerate a beta-blocker... If they're on telehealth, I might think 'well, let's have a go' because I can daily monitor... I can see the stats there so I would know if they're not tolerating the drug... it has encouraged me to be a bit more proactive with medications with some patients. (Professional #3)

Changes in medication were not always received with enthusiasm by patients. Some felt that alterations to their medication did not result in an improvement in their condition. Such changes led some to query prescribing practice under usual care:

As a result of [telemonitoring], they increased the quantity of one of the drugs I'm taking... which hasn't made the slightest difference. (patient #22: male, 76 years)

The medication's been changed and you wonder what's coming up next... they were giving him too many water pills. He was on five so we had to get it reduced to three, and the heart pills; we've got two but they were going to do more but they stopped it, so I've just got one in the morning and one at tea time for him. (Carer #2)

#### *Workload and practice*

The impact of telemonitoring on home visits and existing practice was of particular concern to professionals. The

telemonitoring responsibilities undertaken by professionals were additional to existing professional responsibilities. Consequently, professionals expressed the view that telemonitoring added to workload. They considered it time and resource intensive, describing the work involved in checking online data, in dealing with additional administration, and in increased communication and interaction with patients. Some thought that telemonitoring had the potential to increase rather than diminish the number of home visits (given follow-up requirements in response to telemonitoring data) and this too would add to workload:

I think certain people at health board level think this is going to be great at reducing [home visits] and you're going to be able to just sit in your office and look at everybody, but these patients still need to be seen.....When you're managing a heart failure patient it's not just about the pulse and blood pressure. There's a lot of general management, psychological management and support... to put everybody in the same box because they've got a long-term condition and think you're going to reduce admissions... it's not necessarily going to be able to do that. (Professional #2)

#### **Determining patient applicability to telemonitoring**

Professionals emphasised the importance of selecting suitable patients for telemonitoring. They considered that telemonitoring would be best used to support those with advanced heart failure and/or those non-compliant with medication. Some professionals questioned the utility of telemonitoring stable patients. They determined that telemonitoring should be a short-term intervention used to support medical compliance and the stabilisation of the patient's condition:

If you're taking a low dose of a diuretic water tablet every day and are stable, then there's no point in doing a daily measurement... I don't think there's a need for patients to take their blood pressure and pulse every day when you've got stable heart failure... (Professional #1)

#### **Continuity of care**

Relationship based continuity of care (Freeman & Hughes 2010) was prioritised as important in delivering clinical support for telemonitoring services by both patients and professionals. Many patients expressed a preference for being telemonitored by professionals with whom they had an existing association. (Some felt their GP was the best person to undertake telemonitoring.) Correspondingly, professionals stressed that effective telemonitoring could only be accomplished by 'getting to know' the patient, by inter-

preting and contextualising telemonitoring data relative to the identification of an individual's 'normal' readings/state of health over time, and through the resultant application of clinical knowledge, skills and experience. Professionals discussed proposed models of future telemetric provision, including the proposition of a centralised regional service, operated by non-clinical professionals, which had been mooted by healthcare managers. They considered integration of telemetric provision with local practitioner services preferable to centralised 'call centre'-type provision, emphasising the value of relationship-based continuity of care over cost benefits associated with centralisation:

Telehealth works better when you know the patient because you can look at the information, you'd know roughly what's been happening with that patient over the last week. If you don't know that it can lead to decisions being made that perhaps are not the best decisions. (Professional #3)

## Discussion

Patients and professionals focussed on the processes involved in managing change and in adjusting to telemonitoring provision, either as recipient or provider. Three aspects were particularly prevalent across the themes identified in analysis: managing patient expectations of service provision, managing the expectations of service managers on issues of cost and cost efficiency and envisaging future service development. Each contains challenges to the acceptability and utility of telemonitoring as 'normalised' day-to-day care provision (May *et al.* 2003).

### Great expectations

Patients with CHF expressed a high level of satisfaction with telemonitoring. Many stated that they liked being telemonitored because they felt reassurance in having someone 'watching over them'. Whilst this finding is reflected in similar studies (Mortara *et al.* 2009), what is particularly novel about it in the context of this study is the faith placed by patients in the value of what was often perceived as constant practitioner surveillance. This faith did not waver despite the high frequency of equipment failure reported by patients. For those harbouring concerns about their state of health, telemonitoring was seen as a lifeline, a virtual safety net that provided peace of mind. Patients placed tremendous trust in the diligence and pro-activity of professionals in responding to transmitted data, with some assuming that monitoring was instant and continuous (despite being given information describing the actual

parameters of provision). The misalignment generated by the patients' expectations of the extent and frequency of telemonitoring and the reality of actual monitoring activity undertaken by the professionals providing the service, caused some practitioners concern. In developing telemetric systems, health service managers and professionals face the challenge of managing the expectations of all stakeholders in a way that maximises patient safety and operates within resource constraints.

### Issues of cost

In healthcare policy, telemonitoring is often presented as a means of reducing hospital admissions and reducing healthcare costs (UK Department of Health 2011). The professionals operating the telemonitoring service reached the view that expected cost savings in using telemonitoring may be offset by the actual costs of operating such services. Whilst they considered that telemonitoring presented the possibility of a reduction in hospital admissions, they were uncertain whether the perceived cost savings associated with telemonitoring could be achieved given the expense of the technology, which had been purchased for the service, the associated costs of installation, maintenance, training and support and the resource implications of practitioner time spent in undertaking telemonitoring-related work with regard to local service arrangements. Nonetheless, both patients and professionals considered that telemonitoring provided an enhanced quality of patient care. Such perspectives present challenging questions regarding the (economic) viability of the telemetric intervention. Given that telemonitoring was initially conceptualised, in part, as a money-saving proposition, would high costs associated with the introduction and maintenance of such provision be a price worth paying? A key challenge facing the adoption of telemonitoring is whether technologies and services can be introduced, which provide enhancements to the quality of patient care, whilst at the same time operating in a cost-efficient manner. In this study, professionals were not convinced by the arguments that they had heard from managers regarding cost saving further to service re-engineering. Economic analysis is required to support a greater understanding of the financial costs of models of telemonitoring provision. However, it is recognised that a long-term strategy to realise the (economic) benefits of telemonitoring may present difficulties in the adoption of innovative interventions, which are expected to deliver cost benefits in the short term.

### Envisaging future service development

There is increasing recognition of the importance of project planning and continuous systematic evaluation of eHealth



interventions in order to maximise benefit and minimise harm (Catwell & Sheikh 2009a). The telemonitoring service in this study bore an evolutionary approach to service design, contingent on usual care. Patients and professionals described a number of problems relating to service development and implementation, notably with regard to the technology itself, workload management issues and interoperability issues with usual care. Both groups presented many suggestions for service improvement. Professionals stressed the importance of effective leadership and project management in the development of future telemetric service provision. It is important that the development of future telemetric provision retains the active involvement and engagement of stakeholders groups. New ways of working need to be identified that support and foster continuous feedback and evaluation from patients and professionals during the processes of service development and implementation. However, it is recognised that the (re)distribution of power and responsibility in service development presents many challenges (Catwell & Sheikh 2009b).

### Strengths and weaknesses of this study

This research was undertaken against a backdrop of rapid advancements in the field of telemonitoring technology and corresponding NHS service developments. The emergence of alternative technologies may open new avenues in telemonitoring service provision and may, subsequently, generate different views of telemonitoring from those involved. This study, undertaken in one health board region, presents a qualitative investigation of the views of patients and professionals on telemonitoring for CHF at an early stage in the development of both the technology and the application of the technology in an operational context. It sheds light on the 'real life' issues and challenges faced by telemonitoring 'pioneers' attempting to develop and deliver innovative provision within the challenges and constraints of an existing healthcare system. In this context, the research identifies key practical issues for healthcare professionals to consider in the development of future service development in this field.

### Relevance to clinical practice

#### *A targeted approach*

Recent research has begun to examine the applicability of telemonitoring for population subgroups. The views of the professionals interviewed in this study support recent findings that suggest a targeted approach to telemetric intervention related to age, medication and disease severity effects positive outcomes (Middeke 2012). Professionals welcomed

the possibility of telemonitoring for some types of patients, notably those with advanced heart failure and/or with poor adherence to prescribed medication. In addition, they considered that telemonitoring had particular utility in supporting the stabilisation of patients at home subsequent to hospital discharge. In both cases, professionals conceptualised telemonitoring as a short-term intervention. Further research is required to fully investigate the implications and consequences of a targeted, short-term approach to telemetric intervention in this context.

#### *Towards telemetric supported self-management*

Increasingly, telemonitoring is viewed as a means of delivering patient self-management (Scottish Government & Long Term Conditions Alliance Scotland 2008). Similar to the findings of earlier research (Polisena *et al.* 2010), this study found that telemonitoring enhanced patients' knowledge and understanding of their condition.

It was also found that patients were compliant in routine monitoring behaviours (in alignment with the findings of Radhakrishnan & Jacelon 2012). However, reticence was identified among some patients relating to their involvement in self-directed medication during telemonitoring. Patients held the view that professionals, rather than themselves, held central responsibility for the management of their condition. Professionals queried the applicability of the technology to support self-management. Both groups expressed degrees of uncertainty regarding the role and/or application of telemonitoring systems in enabling self-management behaviours. Professionals discussed the importance of adequate training and support, both for patients and themselves, in order support effective approaches to telemetric self-management.

The results of this study indicate that further work is required by patients and professionals to develop a shared understanding of self-management and of the role and function of telemonitoring as an enabling intervention within this context. In addition, the development of future telemetric approaches to self-management require the explicit recognition of the objective of self-management within the framing of service provision, the development and/or selection of appropriate facilitative technologies that support and empower people to self-manage, and a renegotiation of the patient-practitioner relationship in order to define and delineate roles and responsibilities towards care and treatment.

### Conclusions

Patients and professionals considered telemonitoring useful in the management of CHF, although with some caveats. Patients liked telemonitoring because they felt reassurance

arising from what was perceived as continuous practitioner surveillance. Professionals expressed concern regarding perceived patient dependence on practitioner support. They considered that telemonitoring was best used as a short-term intervention to support stabilisation in patients discharged from hospital. Increased workload was also a concern. Both groups acknowledged the need for improved technology and changes to service provision in order to better meet the intended objectives of the service, particularly with regard to enabling self-management.

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## Contributions

Study design: BMc, JH; data collection and analysis: PF, JU and manuscript preparation: PF, JU, LMc, JH, MD, AS, BMc.

## Conflict of interest

None.

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## Appendix 1: CHF patient interview topic guide

- 1 Experience of managing symptoms prior to trial (a typical day).
  - Ability of patient to recognise/act on changes.
  - Responsiveness of care team in recognising/acting on changes.
- 2 Experience of recruitment, installation, training process.
  - Suggestions for improvement.
  - Perceptions of questionnaire and other baseline measures.
- 3 Experience of managing symptoms with the system (a typical day).
  - Ability of patient to recognise/act on changes with system.
  - Responsiveness of care team in recognising/acting on changes with system.
- 4 Acceptability/usability of system.
  - Online questionnaire (Symptoms, medication).
  - Peripherals (list).
  - Perceived cost-benefit.
- 5 Impact on early detection/prevention of hospital admission.
  - Patient perception.
  - Hospitalisation (frequency/duration/appropriateness).
  - Changes in medication.
  - Changes in treatment.

## 6 Impact of new evidence on self management and professional support.

- Changes in how patient feels about their condition or their care.
- Changes in how patient manages their care.
- Changes in how patient feels their care is managed.
- Impact on quality of life.

## 7 Best and worst things.

## CHF GP/Nurse interview topic guide

- 1 Can I ask what your role normally is?
  - Normally
  - On project
- 2 Experience of managing symptoms with the system (a typical day).
  - Talk through normally usage.
  - Impact (if any) on 'usual' workload.
  - How this compares with 'normal care'.
  - Has it changed the way care is managed?
  - Has it changed perception of how care should/could be managed?
  - How has the monitoring changed the way patients and doctors manage the condition?
- 3 Acceptability/usability of system.
  - Peripherals (list).

- Online questionnaire (symptoms, medication).
  - How could it be improved.
  - Best and worst thing.
- 4 Impact on early detection/prevention of hospital admission.
- Has it been helpful in early detection/prevention?
  - Hospitalisation (frequency/duration/appropriateness).
  - Has it prompted changes or reviews in medication or treatment?
  - Any examples of interventions that wouldn't otherwise have happened?
- 5 Views on the following operational issues:
- Installation phase.
  - Patient training in using the system.
  - Patient's use of system (redifferent patient/socio-economic groups).
  - Support and maintenance? Identification and follow-up on technical issues?
  - Patient perceptions of disease and their self-management
  - Impact on patient–doctor interaction
  - Interpretation of results/protocols
  - Risks (technical/clinical/organisational?)
- 6 What would your key criteria for a successful project be?
- 7 Do you think the product should be rolled out across Lothian? If so, what ways could that be done?

## Appendix 2: Telescot qualitative study – CHF patients – coding frame

### Theme 1: Living with CHF

Diagnosis  
*A Patient's story*  
*Interaction with heart failure nurse*

### Theme 2: Setting up service: in preparation for tele-service

Installation  
*Positive feedback*  
*Unexpected arrival*  
*Problems associated with installation of broadband telephone line*  
*Location of installation*  
*Delays*  
*Complexity*  
Training and initial information provision  
*Positive feedback*

*Negative feedback*  
*Domestic distractions occurring during training*  
*Erm, what training?*

### Theme 3: Receiving tele-service

Initial expectations  
Views of the service  
*Telemonitoring providing reassurance*  
*Is anybody there?*  
*Better to be (tele-) monitored by your own GP/continuity of care*  
*Teleservice in relation to usual care*  
Medication  
*Changes resulting from teleservice*  
Interaction with family and carers  
*Receiving support*  
*Keeping the grandchildren at bay*  
Cost issues  
*Am I worth it?*  
*Is it worth it?*  
Withdrawal from service

### Theme 4: Undertaking tele-monitoring

Expectations  
Training  
Criteria for patient selection for teleservice (and later discharge)  
Perceived impact on job role and responsibilities  
Perceived impact on patient–practitioner relationship  
Perceived impact on workload  
Perceived benefits of telemonitoring  
Perceived negatives of telemonitoring  
Measuring 'success'  
Service management  
*Development*  
*Recording and accessing patient data and patient information management systems*  
*Perceived management deficiencies*  
Models of future service delivery  
*Continuity of care*  
*Centralised regional provision*

### Theme 5: Using the technology

General usability  
Easy to use  
Usage and age

Data confidentiality/security  
 Intel® Health Guide  
 Questionnaire  
 Noise issues  
 Illumination issues  
 Size  
 Audio/Voice-over  
 Technical problems  
 Patient generated errors  
 Limitations

Having to leave the technology powered on

Blood pressure monitor

Usage

Technical problems

Patient generated errors

Pulse oximetry device

Usage

Technical problems

Battery usage

Too tight fitting

Scales

Usage

Patient generated errors

Units of measurement

Limitations

Suggestions for improvements to the technology

Powered on only when required/have an on-off button

Have a print-out facility for data

Have a messaging system/receipt of successfully transmitted data

Technical functionality to enable dialogue between patient and telemonitoring staff

Facility to switch off voice over

Facility to provide greater depth/flexibility of response - online questionnaire

Use of alternative technologies

Wider application: telemetry for monitoring co-morbidities

## Theme 6: Self-management

The daily routine

A disciplined approach

Measuring at different times

Forgetting

Prefer to take readings at my time of choosing

Taking readings

Gauging condition

Information and empowerment

Not interested

Reacting to readings

Supporting self-efficacy

Supporting medical compliance and control

Making decisions regarding lifestyle choices (Watching the weight)

Waiting for the call from telemonitoring staff

Perceptions of patient dependence on teleservice

Telemetry reducing contact with 'usual care (General Practice)

Compiled by: Peter Fairbrother, Telescot

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