

REVIEW PAPER

Factors affecting frontline staff acceptance of telehealth technologies: a mixed-method systematic review

Liz Brewster, Gail Mountain, Bridgette Wessels, Ciara Kelly & Mark Hawley

Accepted for publication 25 May 2013

Correspondence to L. Brewster:
e-mail: eb240@le.ac.uk

Liz Brewster PhD
Research and Teaching Fellow
Department of Health Sciences, University
of Leicester – Social Science Applied to
Healthcare Improvement Research
(SAPPHIRE) Group, UK

Gail Mountain DipCOT MPhil PHD
Professor of Health Services Research
(Assisted Living)
University of Sheffield – School of Health
and Related Research, UK

Bridgette Wessels DPhil
Lecturer
University of Sheffield – Sociology, UK

Ciara Kelly MSc
PhD student
University of Sheffield – Psychology, UK

Mark Hawley PhD Hon FRCSLT CSci
Professor of Health Services Research
University of Sheffield – Health and Related
Research, UK

BREWSTER L., MOUNTAIN G., WESSELS B., KELLY C. & HAWLEY M. (2014)
Factors affecting frontline staff acceptance of telehealth technologies: a mixed-
method systematic review. *Journal of Advanced Nursing* 70(1), 21–33. doi:
10.1111/jan.12196

Abstract

Aim. To synthesize qualitative and quantitative evidence of front-line staff acceptance of the use of telehealth technologies for the management of Chronic Obstructive Pulmonary Disease and Chronic Heart Failure.

Background. The implementation of telehealth at scale is a governmental priority in countries including the UK, USA and Canada, but little research has been conducted to analyse the impact of implementation on front-line nursing staff.

Data sources. Six relevant data bases were searched between 2000–2012.

Design. Mixed-method systematic review including all study designs.

Review methods. Centre for Reviews and Dissemination approach with thematic analysis and narrative synthesis of results.

Results. Fourteen studies met the review inclusion criteria; 2 quantitative surveys, 2 mixed-method studies and 10 using qualitative methods, including focus groups, interviews, document analysis and observations. Identified factors affecting staff acceptance centred on the negative impact of service change, staff–patient interaction, credibility and autonomy, and technical issues. Studies often contrasted staff and patient perspectives, and data about staff acceptance were collected as part of a wider study, rather than being the focus of data collection, meaning data about staff acceptance were limited.

Conclusion. If telehealth is to be implemented, studies indicate that the lack of acceptance of this new way of working may be a key barrier. However, recommendations have not moved beyond barrier identification to recognizing solutions that might be implemented by front-line staff. Such solutions are imperative if future roll-out of telehealth technologies is to be successfully achieved.

Keywords: attitudes, chronic obstructive, health services research, heart failure, pulmonary disease, systematic reviews and meta-analyses, technology

Why is this research or review needed?

- Telehealth is considered by policy to be an attractive, workable solution, capable of meeting the healthcare needs of increasing numbers of people living with long-term conditions.
- Front-line staff and, in particular, nurses are key to the successful delivery of telehealth in practice.
- Systematically reviewing literature on front-line staff acceptance of telehealth clarifies their role in the delivery of these services and identifies potential barriers to implementation.

What are the key findings?

- Nursing staff acceptance of telehealth is critical to effective service delivery, but barriers to acceptance include concerns about autonomy and the impact on the staff–patient relationship.
- Identifying tailored solutions to improve staff acceptance is key; however, current recommendations tend to be generic, rather than the issues affecting the front-line worker.
- Having easy-to-use, reliable equipment, collaborative involvement in service design and training and support may improve staff experience of using telehealth.

How should the findings be used to influence policy/practice/research/education?

- Policy is driving forward the introduction of telehealth and the response of front-line nursing staff to this significant service change is critical for wide-scale adoption.
- Telehealth necessitates self-monitoring by the patient; front-line staff will have to learn to work within this new paradigm of treatment and care.
- Implementation strategies to promote use of telehealth within care pathways should recognize the impact upon established practice and include education and support for new ways of working.

Introduction

This article reports on a systematic literature review of front-line staff acceptance of telehealth. It focuses on services for people with Chronic Obstructive Pulmonary Disease (COPD) and Chronic Heart Failure (CHF). Telehealth is deemed to be appropriate for both of these long-term conditions as avoidance of deterioration necessitates the regular monitoring of vital signs. If individuals are able to monitor their symptoms, then quality of life should improve (Bodenheimer *et al.* 2002). There is also the potential to make health care more efficient using tele-

health as face-to-face encounters with clinical staff may reduce. The validity of these benefits for individuals and for services is underscored by recent UK evidence (Stevenson *et al.* 2012). This suggests that telehealth may result in lower hospital admission rates and highlights the need for a timely review of studies about telehealth and its acceptance by service providers. This article identifies and discusses the available evidence to map out strategies for front-line staff, which will facilitate telehealth use in patients with COPD/CHF.

Background and rationale

Telehealth has been described as the ‘use [of] equipment to monitor people’s health in their own home...[monitoring] vital signs such as blood pressure, blood oxygen levels or weight’ (Davies & Newman 2010). Patients are educated to measure selected physiological data independently, usually on a daily basis. Data are then transmitted directly to clinical staff or to an intermediary who will alert clinicians if necessary. Responses may be via telephone, video-link or face-to-face care. The non-receipt of data can also result in an alert and subsequent action. The picture is becoming ever more complex due to the changing definition of telehealth to include mobile devices as well as specialist equipment.

Telehealth is recognized as an area for growth in the provision of health care, as more people with long-term conditions require care, potentially delivered via alternate means (Davies & Newman 2010). Policy makers are particularly interested in the possible cost savings that might be derived from telehealth-supported self-management. Initiatives such as the UK’s *3 Million Lives* and work by the USA’s Veterans’ Administration are evidence of the drive to use technology in health care (Department of Health 2011, U.S. Department of Veterans Affairs 2011). Current UK policy suggests that if there is a failure to capitalize on the potential of telehealth as a means of supporting self-management, services for those with long-term conditions will fail to meet needs (Department of Health 2010a). However, the potential of using technology to assist patient self-management is currently underexploited (Broderick & Lindeman 2013). While demographic predictions and the scarcity of resources have underpinned the drive to mainstream telehealth, there are still questions about its clinical and cost-effectiveness (Polisena *et al.* 2009). Accordingly, these uncertainties have meant that telehealth is yet to be embraced by services. The UK Royal College of Nursing (RCN) report on ehealth reveals low awareness of telehealth amongst healthcare professionals, which may impact

on its development and use (RCN 2010). It has been suggested that scepticism about telehealth on the part of front-line staff is one of seven potential barriers to telehealth implementation, along with strategic planning, project management, identifying appropriate patients, technology, partnership working and funding (Joseph *et al.* 2011). Despite these concerns, the policy promotion of telehealth in practice – particularly in the USA and UK – suggests that implementation will continue.

The review

Aim

The review synthesizes current evidence about the perspectives of front-line staff who deliver services that include telehealth to COPD/CHF patients and uses this evidence to identify barriers and facilitators to staff acceptance. COPD/CHF were chosen as exemplar conditions due to their current and predicted high volume and associated service demand. The diversity of delivery of telehealth services meant that limiting the review to two health conditions was appropriate.

Design

A systematic search focused on research addressing front-line staff acceptance of telehealth was conducted. For the purposes of the review, the term ‘telehealth’ was a primary search term, but it should be noted that inconsistent use of terminology (e.g. telehealth, telemedicine and telemonitoring) impacted on study selection, as a significant number of articles had to be located in full-text form to ascertain the nature of the equipment used within the study. Similarly,

‘front-line staff’ needed to be defined; the term is used here to describe any healthcare personnel involved in the direct delivery of telehealth or associated patient care. Service delivery is often conducted through multidisciplinary teams, with nurses contributing significantly, although job titles varied throughout.

An initial scoping review identified an absence of relevant randomized controlled trials (RCTs) or cohort studies. Consequently, all study designs were included in a mixed-method systematic review to ensure a comprehensive representation of current evidence. Centre for Reviews and Dissemination methods were applied to identify and appraise studies, and extract evidence (University of York 2012). Studies were included if they reported on interventions that used technology to remotely fulfil the healthcare needs of COPD/CHF patients, including video-phone links and remote monitoring equipment supported by peripherals (e.g. blood pressure monitors, pulse oximeters). Studies were included if they reported on interventions that used technology to remotely fulfil the healthcare needs of COPD/CHF patients, including video-phone links and remote monitoring equipment supported by peripherals (e.g. blood pressure monitors, pulse oximeters).

Search methods

Studies were identified using the following electronic databases: Assia, AMED, British Nursing Index, CINAHL, Embase, Ovid Medline and Web of Knowledge. Terminology was systematically mapped to the appropriate Medical Subject Heading (MeSH), which ensured full coverage in Medline and identified keywords for non-MeSH database searching. The use of controlled vocabulary and wildcard

Table 1 Search terms and structure.

#1	Telehealth or “telemedicine” or telecare or telemonitor*
#2	“Blood Pressure Monitoring, Ambulatory” or “Monitoring, Ambulatory” or “Monitoring, Physiologic” or “Blood pressure monitoring” or “Respiratory Function Tests” or “Vital signs monitoring”
#3	“Heart failure” or CHF or “Pulmonary Disease, Chronic Obstructive” or COPD
#4	#1 OR #2 AND #3
#5	Limit #4 to 2000-current
#6	“Attitude of Health Personnel” or “Nurse-Patient Relations” or “Nursing Staff, Hospital” or “Health Knowledge, Attitudes, Practice” or “Health Personnel” or “Workload” or “Communication Barriers” or “Inservice Training” or “Empathy” or Staff workload or staff perspective* or Clinical champion* or “Capacity Building” or “Critical Pathways” or Care pathway* or “Decision Making, Organizational” or “Capacity” or Change management or “Delivery of Health Care, Integrated” or “Diffusion of Innovation” or “Leadership” or Strategic planning or “Organizational Culture” or “Organizational Innovation” or “Organizational Objectives” or “Planning Techniques”
#7	#5 AND #6

MeSH terms in inverted commas; wildcard operators represented by *.

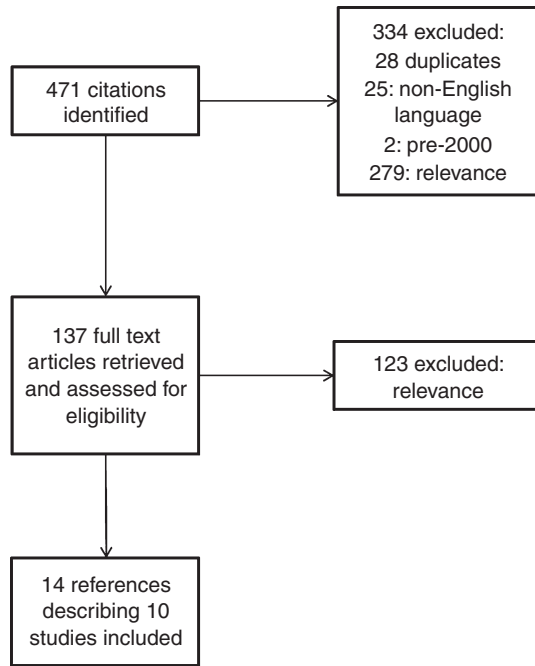


Figure 1 Flowchart of study selection process.

operators adapted the search strategy for each database. Search results were limited from 2000–January 2012, and restricted to papers published in English. Technology trialled pre-2000 was considered less relevant, as previously identified factors that have prevented mainstreaming of devices in practice, such as internet connectivity, have rapidly improved (e.g. from Public Switched Telephone Network (‘dial up’) internet connections to Digital Subscriber Line (DSL) provision). Search terms included variants on telehealth and associated monitoring of vital signs; CHF or COPD; and behavioural factors, including ‘Attitude of Health Personnel’, and ‘Organizational Culture’. Full search terms and structure are outlined in table 1.

Other sources used to identify relevant studies included index searches of the *Journal of Telehealth and Telemedicine* and *Telemedicine and e-Health Journal*, reference lists and citation searching. IEEE Explore was used to locate relevant conference papers. The OpenDOAR search engine, which searches across university institutional repositories, was used to identify conference papers that might not have been indexed. NHS Evidence (www.evidence.nhs.uk) was used to identify appropriate grey literature, and the Cochrane Central Register of Controlled Trials database was used to identify potentially relevant trials. Mendeley Desktop reference management software was used to organize the results of literature searches and store annotated PDFs.

Search outcome

The search identified 471 titles and abstracts, which were then reviewed. Lack of clarity in some abstracts about the inclusion of factors outlining acceptance led to a relatively high number of full-text articles (137) being obtained and read in more detail, leading to the exclusion of 123 articles (Figure 1). Two reviewers evaluated studies against relevance criteria, and discrepancies between the reviewers were resolved in discussion with the wider study team. Reasons for exclusion included publication language other than English, long-term condition other than COPD/CHF and no discussion of front-line staff acceptance or usage. Table 2 outlines the 14 articles (reporting 10 different studies) that met inclusion criteria and form the basis of the review. Studies were not excluded on the basis of quality or study design.

Quality appraisal

The diversity of methods in the included articles meant that various validated tools were used to assess study quality. As no studies met recognized quality criteria for grade A evidence according to Cochrane hierarchy of evidence, the decision was taken not to exclude relevant studies on quality criteria (Higgins & Green 2011). For the four quantitative surveys and quantitative elements of the mixed-methods studies, the ‘Quality Assessment Tool For Quantitative Studies’ was used to assess the validity, appropriateness of sample, analytical methods and study design (National Collaborating Centre for Methods & Tools 2008). In all cases, quantitative data were provided by survey or questionnaire, which was appropriate as the aim was to ascertain attitudinal data. Similarly, for the ten qualitative studies and elements of the mixed-methods studies, the Critical Appraisal Skills Programme (CASP) ‘10 Questions To Help You Make Sense Of Qualitative Research’ tool was used, supplemented by work on the quality of qualitative research (Long & Godfrey 2004, CASP 2006, Walsh & Downe 2006, Daly *et al.* 2007).

The data extraction process assessed appropriateness of the study design, aims and evaluative rigour of methods. While papers were not excluded on grounds of quality, this appraisal process highlighted small quality issues with many of the papers, for example, inadequate description of aspects such as sample characteristics, recruitment methods or fieldwork (CASP 2006, Higgins & Green 2011, University of York 2012). The overall quality of the papers was adequate, with the methods of analysis and overall study designs of acceptable quality, addressing clearly focused issues using methods appropriate for the research question.

Table 2 Characteristics of included studies.

First author	Year	Location	Study design/methods	Participants, including patients	Duration (months)	LTC
Dinesen	2011	Denmark	Qualitative/observation/ interviews/documentary analysis	6 GPs/6 hospital staff/6 nurses/8 district nurses/ 22 patients	N/S	COPD
Giordano	2011	UK	Mixed/observations/online questionnaire/focus groups	8 health/6 social care staff for questionnaire/6 focus groups	36	COPD/CHF
Hibbert	2004	UK	Qualitative/observations	12 telehealth nurses	13	COPD
Hibbert	2003	UK	Qualitative/observations	12 telehealth nurses	12	COPD
Horton	2008	UK	Qualitative/focus groups/ observations	3 healthcare professionals/1 call centre representative	12	COPD
Johnston	2010	UK	Qualitative/interviews/ focus group	14 patients, 10 carers, 4 individual staff interviews and one staff focus group	N/S	CHF
Lamothe	2006	Canada	Qualitative/observations/ interviews/document analysis	82 individual interviews and 5 group interviews with managers, partners, professionals and patients	42	COPD/CHF
MacKenzie	2010	UK	Mixed/questionnaire	83 GPs/3 CHF nurses	N/S	CHF
Mair	2005	UK	Quantitative/questionnaire/ logbooks	14 nurses; 22 patients	N/S	COPD
Mair	2008	UK	Qualitative/interviews/ observations	11 nurses; 9 patients	14	COPD
Mair	2007	UK	Qualitative/interviews/ observations	38 policy makers, clinicians, technologists, health service managers, patient advocates/11 nurses	N/S	COPD
Oudshoorn	2009	Netherlands	Qualitative/document analysis/interviews	10 (3 heart failure nurses/1 nurse/1 physician/1 manager/1 cardiologist/2 health insurance company managers/1 business development manager)	23	CHF
Shany	2010	Australia	Quantitative/acceptance questionnaire/routine measurement of phone calls, visits, frequency of system log in	42 patients within RCT, participating clinical staff	11	COPD
Sharma	2010	UK	Qualitative/focus groups/ observations	16 staff/3 focus groups	N/S	COPD/CHF

N/S, not specified.

Data extraction

Data were extracted using a tool based on previously discussed resources, modified to record both qualitative and quantitative data. The data extraction tool (Table 3) was designed to 'incorporate both descriptive (what was done) and evaluative (how well it was done) elements' (Long & Godfrey 2004). Data were extracted by one reviewer and discussed by the review team. Results data were extracted verbatim, then grouped into themes arising from the results. Data are reported as presented in the studies, and only data relating to staff were extracted. One exception was if studies included a comparison of staff and patient views, which provided data relevant to review questions. As several studies

did not specify the job description of the staff, and no studies provided demographic details of the sample, data about all front-line staff were included. All identified papers addressed concerns of staff currently using telehealth, with one supplementing this with a prospective survey of attitudes.

Synthesis

The heterogeneous, and mostly qualitative, nature of data to be extracted meant that it was not appropriate to use statistical techniques to synthesize it. The available quantitative data examined different elements of service provision, e.g. frequency of visits, nurse perceptions of accuracy, and so were not comparable. Thematic analysis (Charmaz

Table 3 Data extracted for review.

Data to be extracted	
Study outline	Reference details (<i>title, authors, year</i>) Health condition (<i>COPD/CHF</i>) Research question Country of origin Source of funding Key findings
Study design and aims	Study design (<i>qualitative/quantitative/mixed methods</i>) Aim of the study Appropriateness of study design for aims
Ethics	Discussion of ethical issues (yes/no) Research Ethics Committee approval sought
Setting	Study duration Intervention delivery (nurse, GP, hospital-based etc.) Setting (RCT/home-based etc.) Appropriateness of the setting/justification for setting (yes/no)
Representativeness	Recruitment methods Number of participants enrolled Number of participants included in analysis Number of withdrawals, exclusions, lost to follow-up Sample selection methods (e.g. theoretically informed, purposive, convenience, chosen to explore contrasts) Sample characteristics Appropriateness of the sample size/recruitment methods
Procedural rigour	Data collection methods Appropriateness of data collection methods (yes/no) Adequate fieldwork description (account of how the data were elicited; type and range of questions; interview guide; length and timing of observation work; note taking; recording methods)
Evaluative rigour	Data analysis methods If analysis is thematic, how were the themes derived? Core outcomes of study/whose perspectives were addressed? Theoretical framework/appropriateness – how does it guide/inform data collection/analysis Consideration of relationship between researcher/participants (reflexivity/critical bias) (yes/no) Clear statement of findings (yes/no)
Interpretation	Sufficient data to support findings (yes/no) Integration into previous findings/location within existing knowledge (yes/no) Generalizability/transferability Identified implications for policy/practice Linked studies

2006) and narrative synthesis were therefore used to organize and synthesize emergent data focusing on what (Popay J, Roberts H, Sowden A, Petticrew M, Arai L, Rodgers M, Britten N, Roen K. & Duffy S, Unpublished data) describe as ‘exploring relationships within and between studies’.

Results

Included studies

Fourteen papers, detailing 10 different studies, were included; characteristics of each study are provided in table 2. Eight papers focused on the use of telehealth for COPD, three

on CHF and three on both conditions. Ten papers were written and funded by UK sources, with the remainder conducted in Denmark, Canada, the Netherlands and Australia. Although search inclusion criteria were restricted to papers written after 2000, 9 studies were published 2008–2011, with the remaining five published 2003–2007. There was some grouping of authors, with five papers having F.S. Mair as first or second author, based on several sub-studies conducted for one RCT (Mair *et al.* 2002). Six studies were also concerned with patient views, aiming to obtain a wider picture of implementation.

Studies typically identified between one and eleven different factors that might be barriers or facilitators to

Table 4 Facilitators to staff acceptance.

Facilitators to staff acceptance	Occurrence
Easy-to-use, reliable equipment	7
Collaboration	6
Training and support	5
Flexible and responsive working practices	4
Risk and safety assessment	4
Integration into routine practice	3
Personalization and patient feedback	3
Strong leadership and local champions	3
Trust in technology and service design	3
Maintaining quality of staff–patient interactions	2

Table 5 Barriers to staff acceptance.

Barriers to staff acceptance	Occurrence
Negative impact of service change/implementation	7
Negative impact on staff–patient relationship	7
Low expectations of outcomes/need	6
Negative impact on staff autonomy/credibility	6
Interoperability, information sharing and data security	5
Technical/usage issues	5
Concerns about user-friendliness	4
Reliability/accuracy concerns	4
Technophobia/lack of confidence in technology	4
Installation issues	3
No reduction in workload/improvements in efficiency	3
Patient safety concerns	3
Poor change management	3
Communication issues	2
Lack of training	2

acceptance, structured under the headings: concerns about technology; service design; and impact on staff including the staff–patient relationship. Trust in technology and concerns about safety underpinned a number of these cross-cutting themes. Tables 4 and 5 summarize these themes, with 15 barriers and 10 facilitators identified.

The impact of the integration of telehealth into services was a key barrier (7 papers), as was the perceived negative impact of introducing telehealth for the staff–patient relationship (7). Low expectations of the outcomes of monitoring and no acknowledgement of a need for telehealth were identified (6). Feelings that introducing telehealth had a negative impact on staff autonomy and credibility (6) also need to be taken into account.

While there was overall agreement about identified barriers, there was less consensus about what would help to overcome them. Having easy-to-use, reliable equipment was important (7), as was collaborative involvement in service design (6). Training and support (6) and flexible and respon-

sive services (4) with accurate risk and safety assessments (4) were also recognized. The remainder of the results section focuses on these identified barriers and facilitators.

Impact of implementation and integration

If staff had a poor experience with the initial implementation of telehealth, they were less likely to accept its continued use in practice (Mair *et al.* 2008). ‘Teething problems’ are commonly encountered when making changes to services, but if concerns about service planning and delivery were not addressed, then acceptance remained low (MacKenzie *et al.* 2010). When nursing staff were asked to share responsibilities with other health professionals, this could also cause anxiety (Sharma *et al.* 2010). Often, telehealth was introduced as a pilot project, which was not continued, and several studies reported that integration into routine clinical practice had not been achieved (Lamothe *et al.* 2006, Giordano *et al.* 2011).

Shany *et al.* (2010) tested the hypothesis that telehealth would reduce the burden placed on staff, saving time and unnecessary visits to patients. Burden was measured by the number of home visits and telephone calls made to patients in comparison to a control group. While those with telehealth had fewer home visits (136 compared with 214), more phone calls were made to them (464 compared with 243); therefore, those with telehealth had more contact with nursing staff overall, although this difference was not statistically significant (Shany *et al.* 2010). Staff burden was thus not reduced by the introduction of telehealth, indicating that while it altered staff roles, it did not have an impact on the amount of work conducted. Again, if staff felt that the implementation of telehealth had not improved workload, they were less likely to engage with it (Sharma *et al.* 2010).

Impact on the staff–patient relationship

Staff commented that they gained job satisfaction from having the opportunity to have face-to-face contact with patients (Mair *et al.* 2008). Nurses saw the change from a traditional face-to-face model of intervention delivery to a model mediated by distance and technology as a challenge to their relationship with patients (Oudshoorn 2009, Giordano *et al.* 2011). Telehealth was therefore not seen as an ‘integrated client-focused service’ as nurses felt that the use of technology shifted the focus away from direct contact with patients (Giordano *et al.* 2011). Trust was also a barrier to implementation; ‘unless full trust is...gained; telehealth service could not become a self-sustaining abstract system’ (Sharma *et al.* 2010).

While the majority of nursing staff felt that using telehealth had a negative impact on their relationship with patients, those who had used the telehealth equipment did not express the same view (Mair *et al.* 2005). Patients gave more positive responses than nurses to statements about technical and communication issues (Mair *et al.* 2005). Similarly, comparison of the views of nursing staff and patients in Australia found that nurses responded more negatively to questions about telehealth, and thought that patients found the equipment difficult to use (Shany *et al.* 2010). Staff felt that patients were too dependent on the monitoring equipment and not adequately self-managing their condition, while patients felt that the telehealth equipment reduced anxiety and improved self-management (Shany *et al.* 2010).

Low expectations of outcomes and need

Staff often did not deem telehealth to be necessary, either feeling that automated measurements were not relevant or not needed. Perceptions of telehealth are vital to acceptance; a survey of UK General Practitioners (GPs) found that the majority of those questioned were not confident in the policy-promoted notions that access to telehealth would improve patient care or reduce hospital admissions (MacKenzie *et al.* 2010). Only 33% of those surveyed considered that access to telehealth would improve patient care, and 27% thought that telehealth would reduce hospital admission (MacKenzie *et al.* 2010). Thus, few GPs in this sample were willing to consider a telehealth solution for COPD/CHF management (MacKenzie *et al.* 2010). This has clear implications for other healthcare practitioners working in primary care, who may encounter resistance about telehealth from their colleagues.

Automated objective measurements were seen as inadequate in capturing information about symptoms, in contrast to traditional assessments, which participants described as being obtained through clinical experience and intuition (Shany *et al.* 2010). Thus, telehealth was not seen as making a contribution to clinical care and staff were unwilling to accept its use.

Autonomy and credibility

Changes to caseload management were a further challenge, which could impact negatively upon staff acceptance of telehealth (Giordano *et al.* 2011). Nurses often viewed telehealth as an extra responsibility, rather than as a tool to aid efficient caseload management (Mair *et al.* 2008). Similarly, a lack of control over changes in work routines had

an impact on staff acceptance (Sharma *et al.* 2010). Maintenance of professional identity and credibility was vital; if nursing staff lacked confidence in using telehealth equipment, they felt that this undermined their professionalism as perceived by patients (Hibbert *et al.* 2004, Horton 2008). This lack of confidence appeared to be related to a lack of training, but more importantly to the changes to their role – now mediated by technology – which nurses felt altered the fundamental nature of their job (Hibbert *et al.* 2004, Sharma *et al.* 2010). The belief that introducing telehealth would lead to role removal was repeatedly discussed (Hibbert *et al.* 2003, Mair *et al.* 2008, Sharma *et al.* 2010).

Easy-to-use, reliable technology

Perhaps unsurprisingly, the reviewed papers recorded that telehealth equipment was repeatedly mentioned as affecting acceptance. Installation issues, interoperability, user-friendliness, technical issues and technophobia accounted for twenty-five instances of identified barriers in the reviewed papers. Trust in the technology was often related to risk, as healthcare professionals were not confident about the safety and reliability of the equipment (Mair *et al.* 2007, Sharma *et al.* 2010).

On a practical level, staff interviewed reported that the expectation that they themselves would install telehealth equipment was problematic when they did not have the skills to do so (Mair *et al.* 2008). Suggestions to improve this process included increasing the user-friendliness of equipment, for example, colour-coding cables to alleviate difficulties in dealing with unfamiliar equipment (Hibbert *et al.* 2003). Tangible problems with interoperability cemented technical difficulties, with telehealth not being integrated with existing healthcare technology systems for recording information (Giordano *et al.* 2011). Problems with equipment were seen as a barrier to staff–patient communication because they inhibited conversation and relationship building; staff stated that while they concentrated on fixing technical problems, they felt unable to concentrate on patient needs (Hibbert *et al.* 2004). Technical difficulties meant that staff did not accept the new systems, and studies recommended improved technical support to avoid problems (Sharma *et al.* 2010).

Collaboration and flexible services

Strong leadership and service co-design improved acceptance of new systems (Giordano *et al.* 2011). The introduction of ‘clinical champions’ to take a lead role in a change acceptance model was seen as a valued approach (Hibbert *et al.* 2003, Giordano *et al.* 2011). Recognized

obstacles to the successful use of clinical champions included an absence of appropriate, engaged individuals. The potentially deleterious impact of staff reorganization on the appointment of clinical champions was also identified, with service restructure leading to changed roles (Giordano *et al.* 2011).

Another facilitator to use was the involvement of staff and patients in service design; creating a community of practice built on shared learning assisted with this (Dinesen *et al.* 2011). Developing a mutual learning process aided understanding and helped patients to self-manage as they accepted more of a partnership role in their care with healthcare professionals (Dinesen *et al.* 2011). Increased collaboration between medical professionals within newly created multidisciplinary teams formed to deliver telehealth was also seen as a positive outcome (Lamothe *et al.* 2006). Involvement of patients and front-line staff in the participatory co-design of services was found to contribute to success in one UK project (Giordano *et al.* 2011). Initial collaboration needed to be maintained; a service delivery model that was flexible to change, and responsive to feedback helped to maintain long-term acceptance of telehealth use (Giordano *et al.* 2011). Staff valued services designed to allow them to access a variety of equipment and to make informed, patient-specific choices about the telehealth equipment in use (Horton 2008).

Training and support

Staff training was repeatedly suggested as a facilitator to acceptance in that it can improve confidence; aid familiarity with the technology; improve collaborative working between patients and nurses; and assist with caseload management (Lamothe *et al.* 2006, Horton 2008, Mair *et al.* 2008). Two papers also commented on a lack of training as a barrier to acceptance, and identified individual training sessions as a potential method of increasing acceptance (Hibbert *et al.* 2003, Giordano *et al.* 2011). Ongoing technical and service support, which included learning how to recognize and manage technical problems, contributed towards continued improvements and also maintained acceptance (Johnston & Weatherburn 2010, Sharma *et al.* 2010). Despite the identified importance of education and training, little detail was provided in studies about the nature of training required or how best to deliver it.

Patient safety and risk assessments

Patient safety concerns, which could be overcome using appropriate risk and safety assessment, were mentioned on

7 occasions (Table 4), and the reviewed literature suggests that staff perceptions of medico-legal risk contribute to their acceptance or rejection of telehealth (Mair *et al.* 2007). Interpretations of risk include an awareness that staff feel they have an ethical responsibility for patient care that is not met by replacing face-to-face care with telehealth. Staff in this study also identified that concerns about risk could be used as a potential justification for a lack of acceptance and as 'a method of resisting change' (Mair *et al.* 2007).

Front-line staff were concerned that symptoms that would normally be addressed in a face-to-face consultation would not be detected via telehealth (Mair *et al.* 2008). The nature of the traditional face-to-face healthcare encounter contributed to a lack of trust in new technologies (Oudshoorn 2009). Nursing staff interviewed in four studies described a need to physically see the patient to reassure themselves that the patients' condition was being appropriately managed (Hibbert *et al.* 2004, Mair *et al.* 2007, Oudshoorn 2009, Sharma *et al.* 2010). The perceived impact of changes to staff-patient relationships rests on these concepts of trust and proximity to patients, with staff often required to relinquish making frequent visits to patients using telehealth. Transferring the responsibility for condition management to the patient caused anxiety for staff; staff did not trust patients to self-monitor and make judgements about health-related matters as effectively as professionals (Mair *et al.* 2008). Instead, telehealth was regarded by staff as a system in which professional critical judgement was not as central to clinical decision-making, leaving patients at risk of potential harm.

Discussion

While only a small number of appropriate studies were included in this review, valuable lessons about telehealth implementation can still be identified. The papers reviewed here show that the focus on staff perspectives is quite a recent one, emphasizing the growing appreciation that staff awareness and acceptance are key to implementation. Although some barriers and facilitators discussed in this paper can be found within the wider literature about implementation science, such as training and improved change management processes, telehealth-specific aspects of service implementation can also be defined.

The key issues identified are as follows. First, the implementation of telehealth needs to have the support of staff. Without staff support, pilot projects are often not sustainable or successful, and may not be developed further. The

support of staff is also needed at the design stage and the studies show that the involvement of staff in service design, before the roll-out of telehealth, aids acceptance. Second, staff need to feel that they will continue to use their clinical knowledge and judgement in patient management while using telehealth. This also helps to maintain job satisfaction. Third, the reliability and accuracy of telehealth equipment is important, as, if staff do not trust the equipment to monitor patient symptoms, then they do not view it as an improvement to service provision. Fourth, the equipment needs to be easy to use so that staff can feel confident to introduce it to patients.

While several of these factors impacting on staff acceptance are highlighted in previous work, the studies reviewed in this article emphasize the centrality of staff concerns to successful implementation, and help produce a critical analysis of facilitators to acceptance. Key areas in addressing staff concerns include the provision of training and engaging with all relevant stakeholders when implementing a new system. Very practical aspects, such as ensuring adequate arrangements for installation, also need to be considered.

The evidence presented here suggests that involving staff in service design, and in service delivery, may increase acceptance of process change. The recent UK Whole Systems Demonstrator RCT supports the above claim in that it concluded that 'service innovation can sometimes take longer than product innovation' and this suggests that front-line staff should be seen as stakeholders in service development (Clark & Goodwin 2010). One method of achieving this may be to address service needs and implement infrastructure first, before investing in equipment, rather than purchasing equipment and then trying to change practice. Further research should involve staff in service design to assess the impact on the implementation and take up of telehealth. While several articles recommended the use of clinical champions as a facilitator to successful telehealth implementation at scale, a recent study examining telecare concluded that the role of the clinical champion can be contested when aiming to achieve change (Hendy & Barlow 2012). Issues such as staff reorganization can impact on the use of clinical champions, breaking down established partnerships. Service expansion had mixed effectiveness depending on the relationship between clinical champions and other staff (Hendy & Barlow 2012).

Limitations

Review limitations include the quality of reporting in included studies, which restricted the data that could be

extracted about service implementation. For example, many studies introduced telehealth in a RCT environment, and there was little discussion of the timeline of the introduction of the technology, which might influence acceptance. There was also inadequate detail about telehealth technical specifications and manufacturers. While there is value in comparing patient and staff acceptance, studies reviewed here often focused on patient views to the detriment of detailed analysis of staff acceptance.

Nursing implications

The ageing population and initiatives to increase the number of patients using tele-technologies to manage long-term conditions (e.g. *3 Million Lives* in the UK) suggest that nurses may be expected to engage with telehealth in their working practices at a greater scale (Department of Health 2011). Drives to increase patient self-management also increase the likelihood that telehealth will begin to form a core part of the care pathway for various long-term conditions (Department of Health 2010b). This process needs to be managed successfully to minimize impact on staff; acknowledgement of the impact on staff roles is also essential to ensure that changes are carefully managed. The involvement of nursing staff in service re-design and equipment choice will help improve telehealth acceptance. Training and continuing professional education may raise awareness of telehealth and ensure that nurses are ready to implement telehealth within the care pathway when required. Nurse awareness of how telehealth can enable them to complete some routine monitoring tasks remotely is vital, rather than implementation being seen as a challenge to professional identity and competence. Framing this in relation to policy and practice, it is clear that if the needs of patients with long-term conditions are to be met using technology, then the changing needs of staff also require consideration. Concerns about the safety and reliability of equipment need to be acknowledged and overcome. This presents a challenge to the telehealth industry, which should focus on user-friendliness and reliability by engaging with front-line staff feedback.

Conclusion

The extent of front-line staff acceptance of telehealth has an impact on its wide-scale implementation. The results of this review strongly suggest that staff acceptance is critical to service innovation, and is currently a neglected area of research. As stated by one staff member, 'if I had the choice between a visit or tele [health] I would always do the visit' (Mair *et al.* 2007). Until telehealth is viewed by health

professionals as equal to, or better than, a home visit, there will be challenges to implementation.

This review shows that there needs to be an acknowledgement that implementing telehealth affects the nature of care. It is not simply a question of replacing face-to-face care with technology, and support needs to be given to staff to ensure that they are able to use their skills, judgement and knowledge within this changed context.

The scope of the reviewed research limits the conclusions that can be drawn, but there is the potential for further translational research to ascertain the best practice for overcoming these identified barriers. Several recommendations can, therefore, be made about how to promote, introduce and sustain telehealth initiatives. While many of these centre on providing training and information, as is typical of change management, conclusions can be drawn about the specific nature of this training, which needs to focus on refining processes and maintaining a strong staff–patient relationship, as well as ensuring that training about equipment use considers staff confidence. Concerns about role removal and changes to responsibilities also need to be mitigated if staff are to accept telehealth. This narrative synthesis of current quantitative and qualitative evidence shows that if telehealth is to be implemented at scale, its use for the management of long-term conditions will need to be normalized, and front-line staff acceptance will play an integral role in achieving this in practice.

Acknowledgements

We are grateful to the two anonymous reviewers who provided comments on the draft manuscript. We also thank Dr. Lizzie Coates for her useful comments on this manuscript.

We also acknowledge permission from the authorship team of *Guidance on the conduct of narrative synthesis in systematic reviews* for use of these guidelines.

Funding

This review was conducted as part of the Overcoming the Barriers to Mainstreaming Assistive Living Technologies (MALT) research project at the Universities of Sheffield and Leeds. MALT is a 3-year independent research project funded by the Technology Strategy Board. MALT is an adopted project within the Telehealth and Care Technologies (TaCT) theme of Collaboration for Leadership in Applied Health Research and Care for South Yorkshire (CLAHRC SY). CLAHRC SY is in receipt of funding from the National Institute for Health Research (NIHR). The

views and opinions expressed are those of the authors, and not necessarily those of the NHS, the NIHR, the Department of Health.

Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (http://www.icmje.org/ethical_1author.html)]:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

References

- Bodenheimer T., Lorig K., Holman H. & Grumbach K. (2002) Patient self-management of chronic disease in primary care. *Journal of the American Medical Association* 288(19), 2469–2475.
- Broderick A. & Lindeman D. (2013) Scaling Telehealth Programs: Lessons from Early Adopters, The Commonwealth Fund. Retrieved from <http://www.commonwealthfund.org/Publications/Case-Studies/2013/Jan/Telehealth-Synthesis.aspx> on 1 February 2013.
- CASP (2006) 10 questions to help you make sense of qualitative research. Retrieved from <http://www.sph.nhs.uk/sph-files/casp-appraisal-tools/?searchterm=casp> on 1 October 2012.
- Charmaz K. (2006) *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. Sage Publication, London.
- Clark M. & Goodwin N (2010) Sustaining Innovation in Telehealth and Telecare WSDAN Briefing Paper, London. Retrieved from <http://www.kingsfund.org.uk/publications/articles/sustaining-innovation-telehealth-and-telecare> on 1 October 2012.
- Daly J., Willis K., Small R., Green J., Welch N., Kealy M. & Hughes E. (2007) A hierarchy of evidence for assessing qualitative health research. *Journal of Clinical Epidemiology* 60 (1), 43–49.
- Davies A. & Newman S. (2010) Evaluating Telecare and Telehealth Interventions: WSDAN Briefing Paper, London. Retrieved from <http://www.kingsfund.org.uk/sites/files/kt/Evaluating-telecare-telehealth-interventions-Feb2011.pdf> on 1 October 2012.
- Department of Health (2010a) Building the National Care Service, London. Retrieved from http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_114922 on 1 October 2012.
- Department of Health (2010b) Generic long-term conditions model, London. Retrieved from http://www.dh.gov.uk/en/health-care/Longtermconditions/DH_120915 on 5 June 2012.
- Department of Health (2011) 3 million lives. Retrieved from <http://3millionlives.co.uk/> on 1 October 2012.

- Dinesen B., Andersen S.K., Hejlesen O. & Toft E. (2011) Interaction between COPD patients and healthcare professionals in a cross-sector telerehabilitation programme. *Studies in Health Technology and Informatics* 169, 28–32.
- Giordano R., Clark M. & Goodwin N. (2011) Perspectives on Telehealth and Telecare: Learning from the 12 Whole System Demonstrator Action Network (WSDAN) Sites, London. Retrieved from <http://www.kingsfund.org.uk/sites/files/kf/Perspectives-telehealth-telecare-wsdan-paper.pdf> on 1 October 2012.
- Hendy J. & Barlow J. (2012) The role of the organizational champion in achieving health system change. *Social Science & Medicine* 74(1), 348–355.
- Hibbert D., Mair F.S., Angus R.M., May C., Boland A., Haycox A., Roberts C., Shiels C. & Capewell S. (2003) Lessons from the implementation of a home telecare service. *Journal of Telemedicine and Telecare* 9(Suppl 1), S55–S56.
- Hibbert D., Mair F.S., May C.R., Boland A., O'Connor J., Capewell S. & Angus R.M. (2004) Health professionals' responses to the introduction of a home telehealth service. *Journal of Telemedicine & Telecare* 10(4), 226–230.
- Higgins J. & Green S. (eds) (2011) Cochrane Handbook for Systematic Reviews of Interventions 5.1.0. Retrieved from <http://www.cochrane.org/training/cochrane-handbook> on 1 October 2012.
- Horton K. (2008) The use of telecare for people with chronic obstructive pulmonary disease: implications for management. *Journal of Nursing Management* 16(2), 173–181.
- Johnston G. & Weatherburn G. (2010) Automated weight monitoring in chronic heart failure: the excluded majority. *Journal of Telemedicine and Telecare* 16(4), 90–192.
- Joseph V., West R.M., Shickle D., Keen J. & Clamp S. (2011) Key challenges in the development and implementation of telehealth projects. *Journal of Telemedicine and Telecare* 17(2), 71–77.
- Lamothe L., Fortin J-P., Labbe F., Gagnon M-P. & Messikh D. (2006) Impacts of telehomecare on patients, providers, and organizations. *Telemedicine Journal and E-Health* 12(3), 363–369.
- Long A. & Godfrey M. (2004) An evaluation tool to assess the quality of qualitative research studies. *International Journal of Social Research Methodology* 7(2), 181–196.
- MacKenzie E., Smith A., Angus N., Menzies S., Brulisauer F. & Leslie S.J. (2010) Mixed-method exploratory study of general practitioner and nurse perceptions of a new community based nurse-led heart failure service. *Rural and Remote Health* 10 (1510), 1–14.
- Mair F., Boland A., Angus R., Haycox A., Hibbert D., Bonner S., Roberts C., Capewell S. & Bundred P. (2002) A randomized controlled trial of home telecare. *Journal of Telemedicine and Telecare* 8(1), 58–60.
- Mair F.S., Goldstein P., May C., Angus R., Shiels C., Hibbert D., O'Connor J., Boland A., Roberts C., Haycox A. & Capewell S. (2005) Patient and provider perspectives on home telecare: preliminary results from a randomized controlled trial. *Journal of Telemedicine and Telecare* 11(Suppl 1 S1), 95–97.
- Mair F., Finch T., May C., Hiscock J., Beaton S., Goldstein P. & McQuillan S. (2007) Perceptions of risk as a barrier to the use of telemedicine. *Journal of Telemedicine and Telecare* 13(suppl 1), 38–39.
- Mair F.S., Hiscock J. & Beaton S.C. (2008) Understanding factors that inhibit or promote the utilization of telecare in chronic lung disease. *Chronic Illness* 4(2), 110–117.
- National Collaborating Centre for Methods and Tools (2008) *Quality Assessment Tool for Quantitative Studies*. McMaster University, Hamilton, ON. (Updated 13 April, 2010). Retrieved from <http://www.nccmt.ca/registry/view/eng/14.html> on 14 June 2012.
- Oudshoorn N. (2009) Physical and digital proximity: emerging ways of healthcare in face-to-face and telemonitoring of heart-failure patients. *Sociology of Health & Illness* 31(3), 390–405.
- Polisena J., Coyle D., Coyle K. & McGill S. (2009) Home telehealth for chronic disease management: a systematic review and an analysis of economic evaluations. *International Journal of Technology Assessment in Health Care* 25, 339–349.
- RCN (2010) eHealth survey 2010 report. Retrieved from http://www.rcn.org.uk/_data/assets/pdf_file/0005/391109/004115.pdf on 12 March 2012.
- Shany T., Hession M., Pryce D., Galang R., Roberts M., Lovell N. & Basilakis J. (2010) Home telecare study for patients with chronic lung disease in the Sydney West Area Health Service. *Studies in Health Technology and Informatics* 161, 139–148.
- Sharma U., Barnett J. & Clarke M. (2010) Clinical users' perspective on telemonitoring of patients with long-term conditions: understood through concepts of Giddens's structuration theory & consequence of modernity. *Studies in Health Technology and Informatics* 160(1), 545–549.
- Steventon A., Bardsley M., Billings J., Dixon J., Doll H., Hirani S., Cartwright M., Rixon L., Knapp M., Henderson C., Rogers A., Fitzpatrick R., Hendy J. & Newman S. (2012) Effect of telehealth on use of secondary care and mortality: findings from the Whole System Demonstrator cluster randomised trial. *British Medical Journal* 344(21 3), e3874.
- University of York (2012) Centre for Reviews and Dissemination Systematic Reviews. Retrieved from http://www.york.ac.uk/inst/crd/index_guidance.htm on 17 February 2012.
- U.S. Department of Veterans Affairs (2011) VHA Office of Telehealth Services. Retrieved from <http://www.telehealth.va.gov/> on 5 February 2013.
- Walsh D. & Downe S. (2006) Appraising the quality of qualitative research. *Midwifery* 22(2), 108–119.

The *Journal of Advanced Nursing (JAN)* is an international, peer-reviewed, scientific journal. *JAN* contributes to the advancement of evidence-based nursing, midwifery and health care by disseminating high quality research and scholarship of contemporary relevance and with potential to advance knowledge for practice, education, management or policy. *JAN* publishes research reviews, original research reports and methodological and theoretical papers.

For further information, please visit *JAN* on the Wiley Online Library website: www.wileyonlinelibrary.com/journal/jan

Reasons to publish your work in *JAN*:

- **High-impact forum:** the world's most cited nursing journal, with an Impact Factor of 1.527 – ranked 14/101 in the 2012 ISI Journal Citation Reports © (Nursing (Social Science)).
- **Most read nursing journal in the world:** over 3 million articles downloaded online per year and accessible in over 10,000 libraries worldwide (including over 3,500 in developing countries with free or low cost access).
- **Fast and easy online submission:** online submission at <http://mc.manuscriptcentral.com/jan>.
- **Positive publishing experience:** rapid double-blind peer review with constructive feedback.
- **Rapid online publication in five weeks:** average time from final manuscript arriving in production to online publication.
- **Online Open:** the option to pay to make your article freely and openly accessible to non-subscribers upon publication on Wiley Online Library, as well as the option to deposit the article in your own or your funding agency's preferred archive (e.g. PubMed).

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.